the OIL AND GAS JOURNAL
PUBLISHED WEEKLY DECEMBER 7, 1959

Depletion treated kindly by critics

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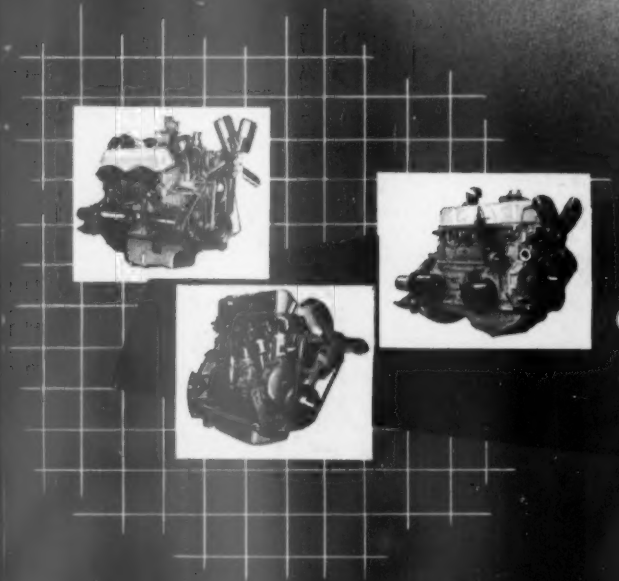
50,000-ft. hole possible, not probable ▸ 78

How to select your drive system ▸ 113

SiF_4 looks good for water shutoff ▸ 123



What the
1960
COMPRESSION RATIOS
mean to refiners p. 80

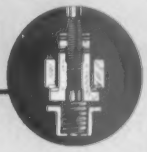
900 to 1400
HORSEPOWER

Big Drawworks with Small Rig Simplicity

Rated at 900 to 1400 net input horsepower, the Mid-Continent U-914-C Drawworks offers the drilling industry all the desirable features of a large rig, while retaining the flexibility and simplicity of operation of smaller units. The U-914-C is designed as a single package unit containing hoisting drum, transmission, rotary drive, and auxiliary brake on a single skid. Rugged in construction and smooth in operation, this unit provides dependable, economical and trouble-free service to meet present day drilling practices. For complete information, contact your local Mid-Continent representative.

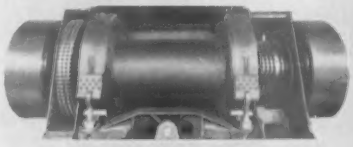
SELF-EQUALIZING 52" x 10" BRAKES

Double adjustment, individually equalized bands have spring loaded spherical dead-end equalizer seats which eliminate bending of the dead-end pins.



EXTRA LARGE BALANCED DRUM FAWICK VC CLUTCHES

A 29" diameter by 53¼" long drum provides three wrap spooling when hoisting 90-foot stands with a 10 line reaving system using 1¼" wire line and LeBus grooving. Hi- and lo-drum clutches are identical 38VC1200 Fawick Ventorque. A splined clutch is provided on the lo-drum side for emergency use.



ALL BEARINGS GREASE LUBRICATED UNITIZED CONTROLS

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THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

OIL AND GAS JOURNAL
Vol. 57 No. 50

Contents December 7, 1959

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Annual index available on request.

TECHNOLOGY—OPERATION

Refining-Processing

Refinery Cost Indexes 112
Refinery construction cost index and refinery operating cost index.

How to Select Refinery and Petrochemical Drivers 113
By W. B. Wilson and I. H. Landes
In 1955 and 1956, the latest 2 years for which published data are available, the chemical and petroleum industries spent over 2 billion dollars to meet purchased-fuel and electric-power requirements. This cost for energy is 15% greater than the total expenditure for new machinery and equipment during this same period. Thus the importance of proper drive equipment is brought home. Part 1 of two parts.

Steel-Jacketed Plastic Pipe Solves Corrosion Problems 132
This piping combines corrosion resistance of plastic and high strength of steel.

Deethanizer Utilizes Propane Sidestream 135
This unit is serving double duty in a crude-stabilization unit at Cities Service's East Chicago refinery. In addition to ethane-and-lighter overhead and butane bottoms, propane is withdrawn in a sidestream.

New Curing Agents Improve Epoxy Coating 138
New hardening agents make it possible to apply a 100% solids coating with conventional spray equipment.

Process Costimating—62 143
Chemicals used for various processes and products.

Pipelining

Engine Analyzer Aids in Engine Tuneup, Determines Malfunctions .. 110
By B. J. Matthews
This device has proved to be a very valuable asset to plant maintenance personnel. Its immediate value is as a tuneup instrument but as experience is acquired, it becomes beneficial in detecting and locating mechanical malfunctions.

Synthetic Diaphragms Cut P.D.-Meter Maintenance 146
By M. P. DeBaets
Practically all large-volume, high-pressure displacement meters operated by Ohio Fuel Gas Co. are equipped with synthetic diaghragms. This includes both producing wells and industrial service installations. The synthetic units last longer, maintain proof longer, operate more accurately at low temperatures, and show less tendency to shrink and leak.

The Economics of Gas Transmission 148
A chart which shows the cost of transporting gas through a representative pipeline system at various throughputs and load factors has been developed for Southern Counties Gas Co.

Drilling-Production

New Charts Pinpoint Problem Pumpers 106
By Bennie L. Franks
A new graphical analysis gives a complete record of pumping history with costs and can be redesigned to suit the needs of any company. The record can be kept by field personnel. Analysis of the data shows up problem wells and points to proper remedial action.

New Water-Shutoff Treatment for Air and Gas Drilling 123
By Charles K. Sufall and Ed McGhee
Solution to one of the big problems in air and gas drilling may now be in sight. Squeezing with silicon tetrafluoride gas promises to make water shutoff routine in most cases and to reduce it significantly in the rest.

General

Union Oil's New Supertanker and Wharf Facilities 103
By Leonard B. Jones
Union's new system at Los Angeles harbor is used to transfer crude oil from tankers 5 miles to the Los Angeles refinery and to transport bunker fuel oil from the refinery to the tankers. Outstanding features include a ship-to-port unloading assembly, centralized control system, and elaborate fire-protection systems.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 7, 1959

Contrasting view of the oil industry last week:

Investment bankers reported disappointment at the poor earnings trend of oil companies.

Economic professors questioned percentage depletion, terming it unfair tax allowance padding profits (p. 73)*

How can you win?

Bankers, meeting in a Florida convention, traced oil's troubles to oversupply.

This lack of inventory control led to price instability and reduced profits. This in turn disenchanted investors who in the past have favored oil stocks for growth.

The earnings record: Oil profits fell 25% during 1957-58 recession compared with 16% drop in composite of other industrial groups. Oil bounced up 24% in first half of 1958 compared with 81% in other industries.

Investment outlook: Oil stocks will be regarded more as income providers rather than avenues for long-term growth.

The professors' comments on depletion were part of a hearing before House ways and means committee.

Actually the allowance got only a mild going over. Both sides of the issue were heard and indications were that the tax-writing committee probably won't change the present allowance, next year at least.

▼ ▼ ▼

The automatic oil field, with crude moving directly from the reservoir through a LACT unit into a pipeline to a refinery, may be just around the corner.

Prediction: Remotely controlled field may be a reality within 5 years. This comes from some members of an API subcommittee studying the development.

This group is struck by wide acceptance of LACT since first sale of crude handled by LACT was made 4 years ago. The system is growing faster than expected. It has proved safer, more efficient, and more profitable because it eliminates waste from vapor losses during storage (p. 76).

---

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

Three New Orleans drilling contractors have pooled their resources in an unusual money-saving, business-getting plan.

They have organized a fourth firm that pays overhead and solicits drilling jobs. Result: Overhead costs have been cut, better bidding practices have put six idle rigs to work (p. 84).

Drilling a 50,000-ft. hole is possible with present techniques and equipment. Actually producing it would be a tougher job.

This conclusion came from a panel of experts speaking in Tulsa on problems facing anyone attempting to drill or produce a superwell (p. 78).

▼ ▼ ▼

New oil field in Western Illinois has independent oil operators busy.

Success of Charles Eager at his shallow producer in Brown County set off the minor boom. What has happened since is one of the most interesting exploration stories of the year (p. 195).

Prolific producers continue to come in near Bethel Salt Dome in Anderson County, East Texas.

Gragg Drilling Co. 1 O. L. Gragg on the dome's southeastern flank has a potential of 37,500 M.c.f. gas daily plus liquid yield of more than 6,000 bbl. of 54°-gravity condensate daily.

Important discovery for the Rockies is Texaco's Weber Pennsylvanian strike at Moffat field in northwest Colorado.

It's a new pay for the field, flowing at rate of 50 bbl. hourly from a 107-ft. pay section. The Weber produces at Rangely, largest field in the mountain states, and is the only major Pennsylvanian production in Colorado. The Texaco find will certainly stimulate new Weber exploration in northwestern Colorado.

Winter's first important gas strike in British Columbia's Clarke Lake sector is Gulf States-Imperial C-8-D Clarke Lake, 10 miles east of Fort Nelson.

Well flowed 10,700 M.c.f. daily from Middle Devonian Beaverhill Lake at 6,298-515 ft. Tests showed 217 ft. of section.

Encouraging oil shows have been made by remote wildcat in far southwestern Texas' Kinney County, so far an unproductive region.

Shows were in the Kiamichi formation below 1,270 ft.

The operators, James P. Kiel and King Oil Co., are drilling with cable tools. They delayed testing pending deepen-

ing and shutoff of water flow from higher zone.

Location southwest of Brackettville is 30 miles from nearest field in a vast, little explored region.

Other field notes: Montana now has 40-acre spacing instead of 20-acre pattern (p. 95)...Rangely flood is moving into high gear but is still far from ultimate goal (p. 93)... Discovery near Bay St. Louis gives Mississippi first oil production in coastal tier of counties (p. 89)...North Dakota has another rank wildcat discovery (p. 94).

▼ ▼ ▼

Octane race appears stalled in 1960, but the outlook for refiners in 1961 and beyond:

...Compression ratios are due to climb again.

...Octane number will be about 103 by 1964.

...Horsepower could take another climb if Ford's new 360-hp. engine is an indication.

...Compacts are off to fast start but their future is still unanswered question (p. 80).

Crude price changes bear watching.

Great Northern Oil Purchasing has trimmed 22 cents per barrel off Midale-type crude from Saskatchewan.

Tidewater has cut Venice field, La., from 7 to 24 cents and Conroe field, Tex., by a flat 30 cents.

Big question: Will these spread to Rockies, Mid-Continent, other Gulf Coast areas? (p. 86).

▼ ▼ ▼

Venezuela's dollar-short government is getting financial assist from the country's biggest oil producers.

In a three-way transaction, Creole and Shell of Venezuela are buying the bulk of $93 million worth of short-term Venezuelan treasury notes. Move is aimed at bolstering country's rapidly shrinking foreign exchange reserves.

Deal will work this way: A group of New York banks will buy the notes from Central Bank of Venezuela for dollars. Creole will buy $48.8 million in notes from the banks, Shell about $30 million.

The two companies then will use the notes to pay income taxes in Venezuela.

▼ ▼ ▼

Big pipelining job faces Texas Electric Service Co. Its problem: Complete new $25-million trunk line from Old Ocean field to Fort Worth and Graham before present gas-supply contracts expire a year from now.

A TESCO subsidiary, Old Ocean Fuel Co., is buying right-of-way feverishly. So far construction contract for the line

has not been let and it appears work won't start before next spring at the earliest.

TESCO will buy gas directly from Old Ocean producers and move the gas through its own line to supply four generating stations. Main trunk will be 24-in., with a 16-in. lateral from Fort Worth to Graham.

Longest pipeline pull in history has been made in the Persian Gulf.

Crews of International Marine Constructors laid 19 miles of 30-in. line in the gulf from Khargu Island to Ganeveh on the Iranian mainland. The 19-mile stretch was made in a continuous pull (p. 98).

▼ ▼ ▼

Note on high cost of government:

Texas' new severance-beneficiary gas tax is causing oil producers some headaches even though levy is supposed to fall almost entirely on pipelines.

Oil producers must file reports even though they produce no gas. They must pay the tax on any gas they use on the lease. And in many instances this costs both the state and the producer much more than the amount of the tax.

For instance: An Abilene oil producer reports he must file six forms a month on his three oil leases. He sells no gas but uses some to run pumping units and heater treaters. To get the data to fill out tht forms plus postage costs him $30 a month. The comptroller tells him it costs the state $12.38 a month to process the forms and send him receipts.

Amount of tax involved: $1.49 a month.

▼ ▼ ▼

Signal Oil isn't talking, but reports in Haifa say the American independent has bought into Paz Oil Co., leading Israeli marketer.

Ownership of Paz reportedly will be one-third Signal, one-third I. Wolfson, London financier, and one-third Israeli Government.

The move, if true, could give Signal outlets for its Venezuelan crude. The move might involve ticklish diplomatic situation in view of official Venezuelan wooing of Arab oil producing countries.

Canada isn't reaping the rewards expected from being exempt from U. S. oil-import restrictions.

Canadian exports into the U. S. have shown no significant increase. Oil exploration in Western Canada is still at a disappointing level.

Combination of factors are blamed: Oversupply in U. S., low tanker rates which give foreign crude bigger edge.

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This downtime cost is enormous—just for packing. It's far higher than the cost of the packing itself ...and a lot more than the pennies saved by buying less expensive, inferior packing.

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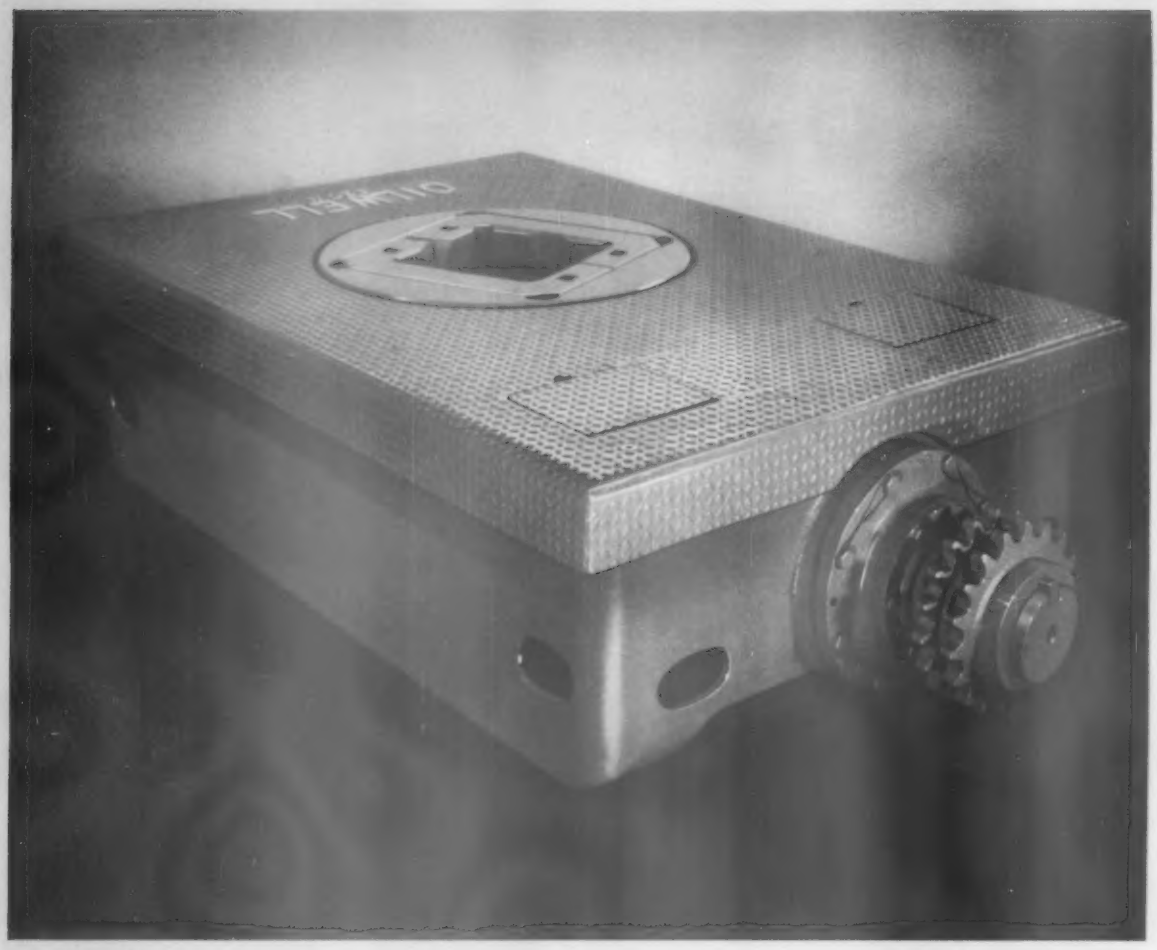

Reduce costs with an "Oilwell" Oilbath Rotary

The patented lubrication system for "OILWELL" Oilbath Rotaries eliminates excessive wear and premature parts replacement because it attacks the friction problem three ways. It provides complete lubrication for gears and main bearing at all speeds; it assures continuous circulation of oil to all vital parts; and it prevents loss of oil. In addition, it prevents oil from becoming contaminated. Drilling mud or other foreign matter is prevented from working into the oil reservoir by means of an effective turntable labyrinth and blowout seal ring. All grease fittings, together with the oil gauge and filler pipe, are grouped under a door in the turntable cover.

The A20½" Rotary (shown above) has a modern box-type base designed for maximum strength and rigidity with minimum weight. Firm support for the turntable and pinion shaft assembly is provided to maintain exact alignment of gears under maximum rated loads. Turntable top projects above cover guard to support casing spider free of cover. Direct-acting turntable lock is easily reached through a second door in the cover.

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Hycar is often the material that can step up sales—it improves present applications or opens the way to new markets. Get more information by writing Dept. CE-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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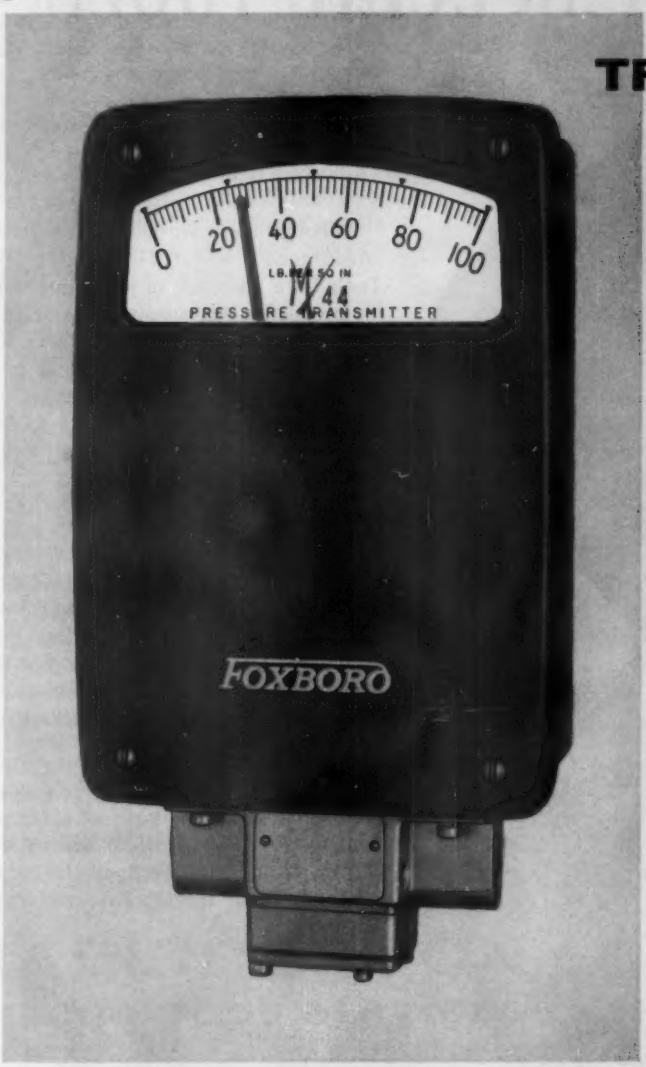

You can check pressure readings at a glance on the Foxboro Pneumatic Indicating Pressure Transmitter. Its open-face, horizontal, 4-inch indicator scale and eye-catching red pointer are clearly visible as far away as 20 feet.

But high readability is just part of the story. Actually, this instrument was engineered from the ground up. Makeshift arrangements have been eliminated, hung-on gauges are gone. Everything is included in one compact (5¾" x 8⅛"), ready-to-install instrument that weighs only eight pounds.

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Zone Isolation Unmatched

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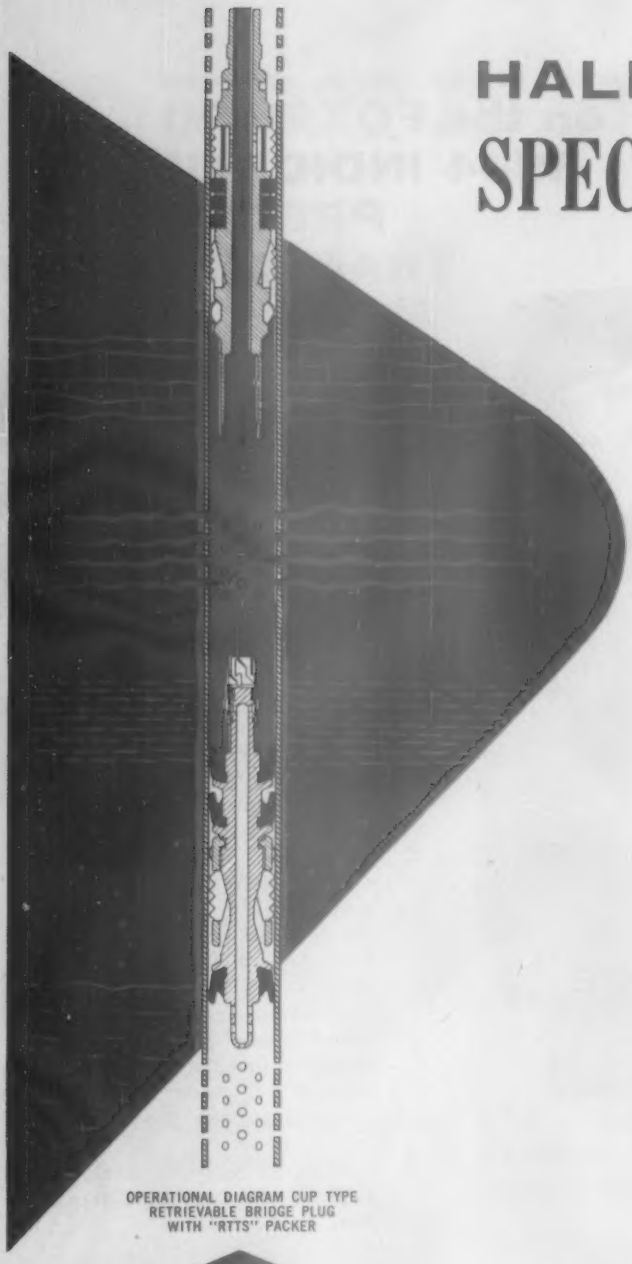

OPERATIONAL DIAGRAM CUP TYPE
RETRIEVABLE BRIDGE PLUG
WITH "RTTS" PACKER

Although flexibility in design permits the advantageous use of Halliburton Special Tools for a multitude of jobs, zone isolation for production improvement is one of their most profitable applications. This is accomplished by forcing a treating fluid into the formation to remove flow restrictions in the naturally permeable channels, or to enlarge the flow channels by chemical action or hydraulic fracturing.

Halliburton Special Tools include well-engineered packers and auxiliary tools that are run on tubing into the cased hole to isolate the zone to be treated. This procedure is designed to force the treating fluid into the designated zone, confine the high pressure to this section only, and realize the maximum production from the well's potential.

Use the unmatched performance of Halliburton Special Tools for the production improvement of your wells. A call to your nearby Halliburton office will bring full information about the Special Tools best suited for your specific requirements. Call Halliburton today!

HALLIBURTON "R-3" TREATING PACKER

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HALLIBURTON CUP TYPE RETRIEVABLE BRIDGE PLUG

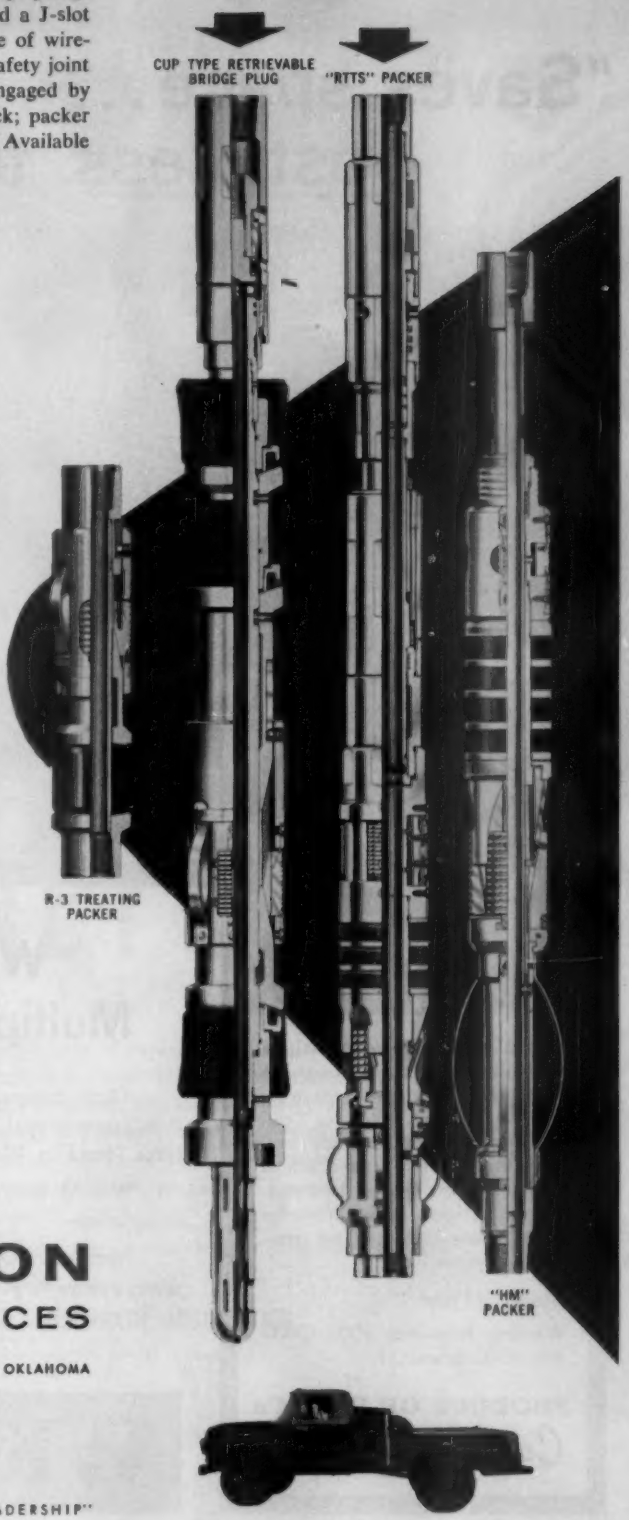
Designed to provide a positive but easily removable plug in cased hole to hold pressure from either above or below. Valuable in providing straddle packer type isolation of zones with virtually unlimited spacing between packers without restriction of flow passage. Especially adapted for running in below a retrievable tool such as the "RTTS" Packer for isolation of one or more zones. Setting and retrieving functions of the Bridge Plug are matched to the "RTTS" Packer; this combination permits "straddling" of any desirable zone, so that multiple zones can be isolated individually with only one trip in the hole.

HALLIBURTON "RTTS" PACKER

The industry's most efficient multi-purpose tool, the Retrievable Test-Treat-Squeeze Packer, is designed for testing, treating and squeezing operations. It permits combination high pressure treating and squeezing applications, as well as testing, with *only one trip into the hole.* Equipped with full-opening fluid passage... incorporates circulating valve and safety joint.

HALLIBURTON "HM" RETRIEVABLE PACKER

A hook wall type packer run on tubing in cased hole to provide a seal above the zone to be fractured or acidized for production improvement. Allows large volumes of fluid to be pumped through tool with minimum drop in pressure. Set by weight of tubing; released by picking up. Hydraulic slips prevent movement of packer up the hole. Can be set and reset for multiple treatments as many times as desired without coming out of the hole.



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Sizes: 1¾" and 2"

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Creative Engineering

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These compact new valves simplify tree construction. They cost less than conventional tree components, yet provide all the outstanding features found in W-K-M's world-renowned oilfield gate valves.

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ISN'T IT ODD ABOUT MONEY?

Money may be made of paper, but if it is professionally handled it will support an awfully heavy load. Like an insurance program.

An insurance program, *any* insurance program, is only as strong as the company behind it. Perhaps that is why employers in Texas buy more workmen's compensation from Texas Employers' Insurance Association than from any other insurance company . . . financial strength and stability are TEIA's hallmark*.

**Surplus for the protection of policyholders as of June 30, 1959. $9,200,217.78.*

TEXAS EMPLOYERS' INSURANCE ASSOCIATION

First Choice of Texas Industry for 45 Years

HOME OFFICE: DALLAS | 25 SERVICE OFFICES IN TEXAS | AUSTIN F. ALLEN, CHAIRMAN OF THE BOARD | BEN H. MITCHELL, PRESIDENT

Sweetest running pipe your money can buy! Stabs, spins-in, tongs-up fast and tight. Utmost uniformity assures positive roundness . . . clean, accurate threads. Utmost uniformity eliminates waste motion!

CASING AND TUBING

SPECIFY REPUBLIC. Fast shipment from mill or distributor stocks.

REPUBLIC STEEL

CLEVELAND 1, OHIO

World's Widest Range of Standard Steels and Steel Products

from

...Powerful, Clamping Action

High-strength Republic Alloy Studs and High Carbon Hex Nuts provide safe, leakproof performance on high pressure equipment. Withstand massive force applied continually or cyclically—without distortion, creep, stretch, or fatigue failure. Full formed, accurate threads allow nuts to be pulled up tight and backed-off quickly to meet maintenance requirements.

...Plastic-Coated Steel Pipe

Republic X-TRU-COAT Plastic-Coated Steel Pipe and Tubing combines the strength of steel with the protection of polyethylene plastic. High-density plastic coating blocks electrolytic as well as chemical corrosion, offers outstanding impact strength, excellent tear- and puncture-resistance, high flexibility that permits short radius bends. Specially-developed "live" adhesive undercoat bonds plastic to steel, never becomes hard or brittle. Mail coupon for complete details.

...Semi-Rigid Plastic Pipe

Republic SRK Plastic Pipe resists highly corrosive chemicals, prevents build-up of scale, offers low friction-loss, yet costs no more than ordinary pipe. Economical brush-applied solvent and plastic fittings permit any type of joint to be made in seconds. SRK is lightweight and easy to install. Cuts with ordinary handsaw. Available in a wide range of pressure ratings and sizes from ½" through 6". Mail coupon for complete information.

REPUBLIC STEEL CORPORATION
DEPT. OG-7721A
1441 REPUBLIC BLDG. • CLEVELAND 1, OHIO

Please send more information on:

- ☐ Electric Weld and Seamless Casing and Tubing
- ☐ Alloy Steel Studs and Hex Nuts
- ☐ X-TRU-COAT Plastic-Coated Steel Pipe and Tubing
- ☐ Republic SRK Plastic Pipe

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

REPUBLIC STEEL

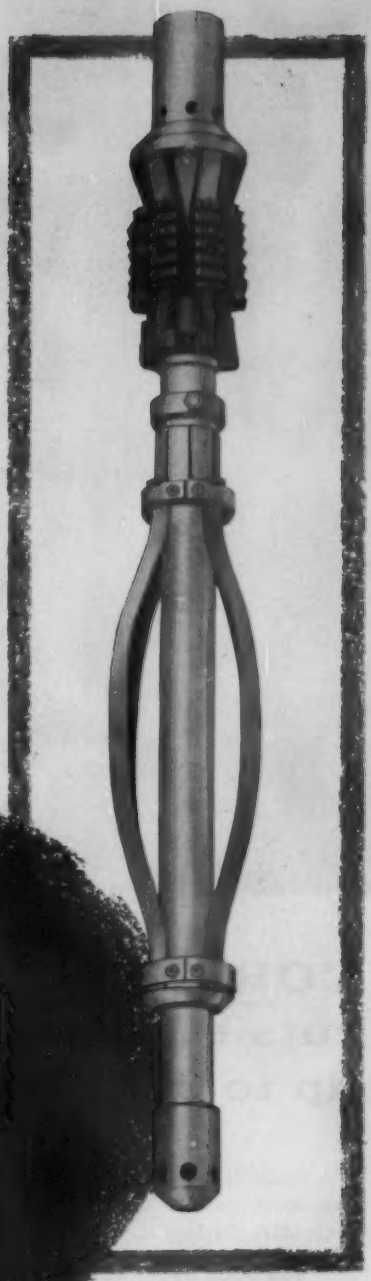
To Open-Hole Straddle Test
Eliminate Tail Pipe
Insure a Good Packer Seat

specify the new Johnston Open-Hole Anchor

Many advantages are offered with this New Johnston Open-Hole Anchor. This is a slip-type device which has wide application because of its flexibility.

The slips are designed and built to give an extra large expansion diameter. This insures seating in wells where the hole may be slightly over drilled diameter.

The Open-Hole Anchor is easy to operate — has simple, positive-action "J" setting. A spring locking nut, incorporating buttress threads, allows easy re-setting of the anchor. When testing is completed, you may rotate out of the hole.



THE PROOF---

Hansford County, Texas
Conventional test at 8800′ in 7⅞″ hole. Used Anchor and single Bob Tail Packer only. No tail pipe. Mud weight 9.8 lbs., estimated 120,000 lbs. on packer and setting tool. No slipping of tool, no problems. Test successful.

Hansford County, Texas
Straddle test in 7⅞″ hole between 3,000′ and 4,000′. Anchor set on first attempt. No bypass necessary. Test successful.

Hansford County, Texas
Straddle test in 7⅞″ hole between 6,000′ and 7,000′. Tool set on first attempt. No bypass necessary. Test successful. Second test run between 5,000′ and 6,000′. Packer failed to seat in washed out hole. Moved up hole, tool and packer set on first attempt.

Hansford County, Texas
Straddle test in 7⅞″ hole between 5,000′ and 6,000′. Tool set on first attempt. No bypass necessary. Test successful.

Liberal, Kansas
Straddle test between 5,006′ and 5,016′. Tools worked well. No trouble. No by-pass necessary. Test successful.

Liberal, Kansas
Selective zone tests between 3,907′ and 3,915′ and 4,672′ and 4,680′. No problems encountered. Tools worked perfectly. No bypass necessary. Test successful.

Liberal, Kansas
Two straddle tests run between 4,662′ and 4,678′ and 4,577′ and 4,614′. Both tests O.K. No trouble whatsoever. Tools worked as expected. Test successful.

Eliminates the need for tail pipe on conventional tests and straddle tests.

Offers flexibility in finding packer seat. If seat is not obtained on initial attempt just pick up and re-set the tool.

You can profit from the savings in dollars and time when you specify the Johnston Open-Hole Anchor. Ask your Johnston representative for full information. You'll be glad you did.

JOHNSTON DRILL STEM TESTING TESTERS

P.O. Box 98, Houston 1, Texas

COREXIT
cuts lifting costs . . . saves up to $1,000 a year per well

COREXIT saves you money. It prolongs the life of your sub-surface equipment, reduces the number of well-pulling jobs and prevents loss in production. Savings up to $1,000 a year per well are not unusual.

The initial COREXIT treatment cleans up your sub-surface equipment, displacing corrosive brine and loose scale from metal surfaces. Then it builds up a tenacious and lasting protective film on these metal surfaces to prevent further corrosion and hydrogen embrittlement. Periodic COREXIT batch treatments with a few hours circulation of the production will give continued protection.

COREXIT is an organic, adsorptive-type corrosion inhibitor. It is available in many different formulas to meet the needs of every producer. It is non-toxic and easy to handle. It has no objectionable odor.

Save your money — use COREXIT!

COREXIT is readily available from Humble wholesale plants throughout Texas and New Mexico. Call the one nearest you for quick on-the-lease or plant delivery, or phone or write:

Humble Oil & Refining Company
Consumer Sales
P. O. Box 2180
Houston 1, Texas

COREXIT is also available through these companies:

in Oklahoma and Kansas—

Pet-Chem, Inc.
Mayo Building
Tulsa, Oklahoma

in Illinois, Indiana and Kentucky—

T. E. Bennett Chemical Company
P. O. Box 245
Salem, Illinois

in Western Canada—

Rice Engineering & Operating Ltd.
10509-81 Avenue
Edmonton, Alberta

HUMBLE OIL & REFINING COMPANY HUMBLE

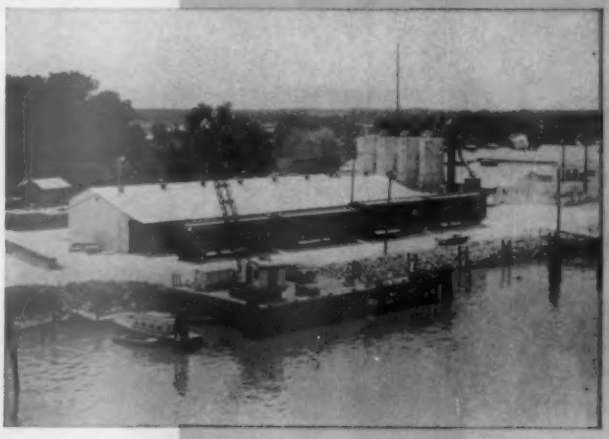
Since
Drilling
Muds
Began

BAROID

First mud supplier to the oil industry . . . Now first with its own company stores near you!

Fast
Direct
Service

Look for the yellow and red Baroid Supply Centers, Marine Terminals or Inland Stores.

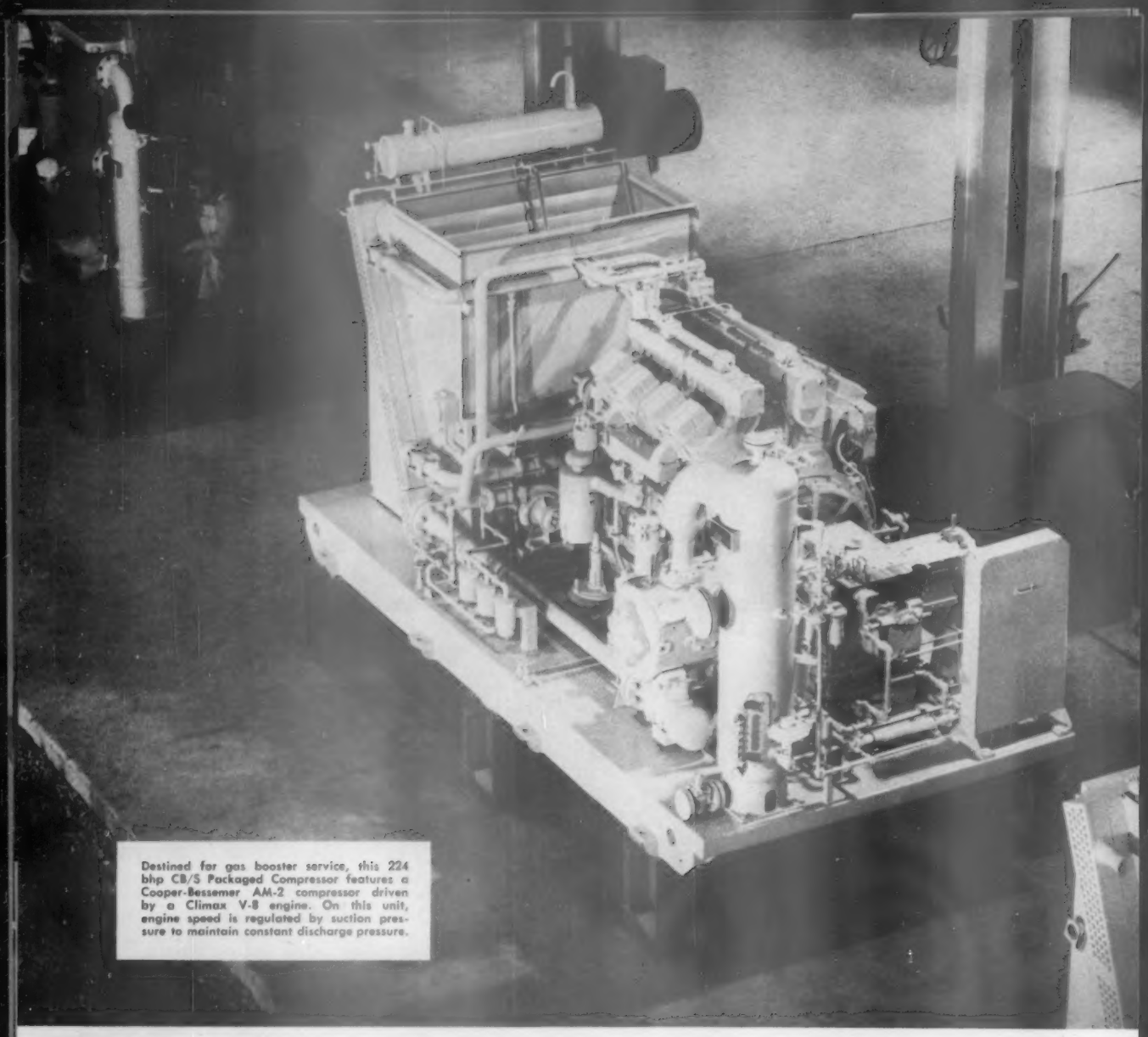


Any Place
Any Time

BAROID

BAROID DIVISION • NATIONAL LEAD COMPANY
MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

8998



Destined for gas booster service, this 224 bhp CB/S Packaged Compressor features a Cooper-Bessemer AM-2 compressor driven by a Climax V-8 engine. On this unit, engine speed is regulated by suction pressure to maintain constant discharge pressure.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

CB/S
PACKAGED
COMPRESSORS

CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.

Instrument Monitors Corrosion Rates While Equipment Stays on Line

Fastest Known Corrosion Rate Measurement

The *Corrosometer* is its name. It proves the effectiveness of Nalco refinery stream corrosion inhibitors . . . in a hurry. It is the fastest known method of determining corrosion rates in operating equipment; manufactured by Crest Instrument Co. under license from Standard Oil Company (Indiana), and distributed worldwide, by Nalco.

Corrosometer readings are taken quickly and accurately, indoors or out. Instrument leads are attached to probes mounted in corrosion trouble spots. One instrument serves virtually any number of probes.

Coupons, Inspections are Slower

Determining corrosion rates by loss-in-weight methods, using coupons inserted in lines, is a much slower process. Valuable in determining average corrosion rates, it lacks the speed that enables the Corrosometer to reveal immediately any change in corrosion rate caused by process variations. Nalco Representatives, as well as Nalco Corrosion Inhibitor customers and prospects, welcome the speed with which the Corrosometer delivers accurate corrosion rate readings as a real contribution to time and money-saving establishment of good corrosion control practices.

Corrosometer Can Show Day-to-Day Corrosion Rates in System

Readings taken with the Corrosometer show the corrosion rate in the system for a predetermined interval of time. The interval may be as long as desired—or as short as a day or less. Thus checks of Nalco treatment effectiveness, as well as prompt detection of unexpected increases in corrosivity, are practical and accurate with the Corrosometer.

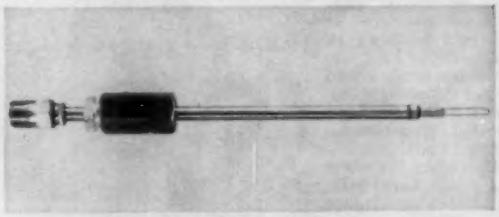
How Corrosometer Works . . .

Utilizing the Kelvin electrical bridge circuit, the Corrosometer compares resistances of two similar probes: one protected from corrosion, the other directly in contact with the liquid or gas in the equipment under test. Corrosion of the unprotected probe increases its electrical resistance, and the difference between probe resistances is directly convertible to corrosion-rate readings of high accuracy.

Retractable probes, for easy replacement without shutting down the system, and probes for high temperature and high pressure systems make the Corrosometer a valuable tool in checking Nalco Results in all types of corrosion-prone equipment.

Your Nalco Representative can give you full details on both the Corrosometer and Nalco corrosion inhibitors. Call him today — or write for descriptive literature.

Refinery Corrosion Probe



Retractable probe can be installed through a gate valve; replaced quickly without taking equipment off line.

National Aluminate Corporation is now

NALCO CHEMICAL COMPANY

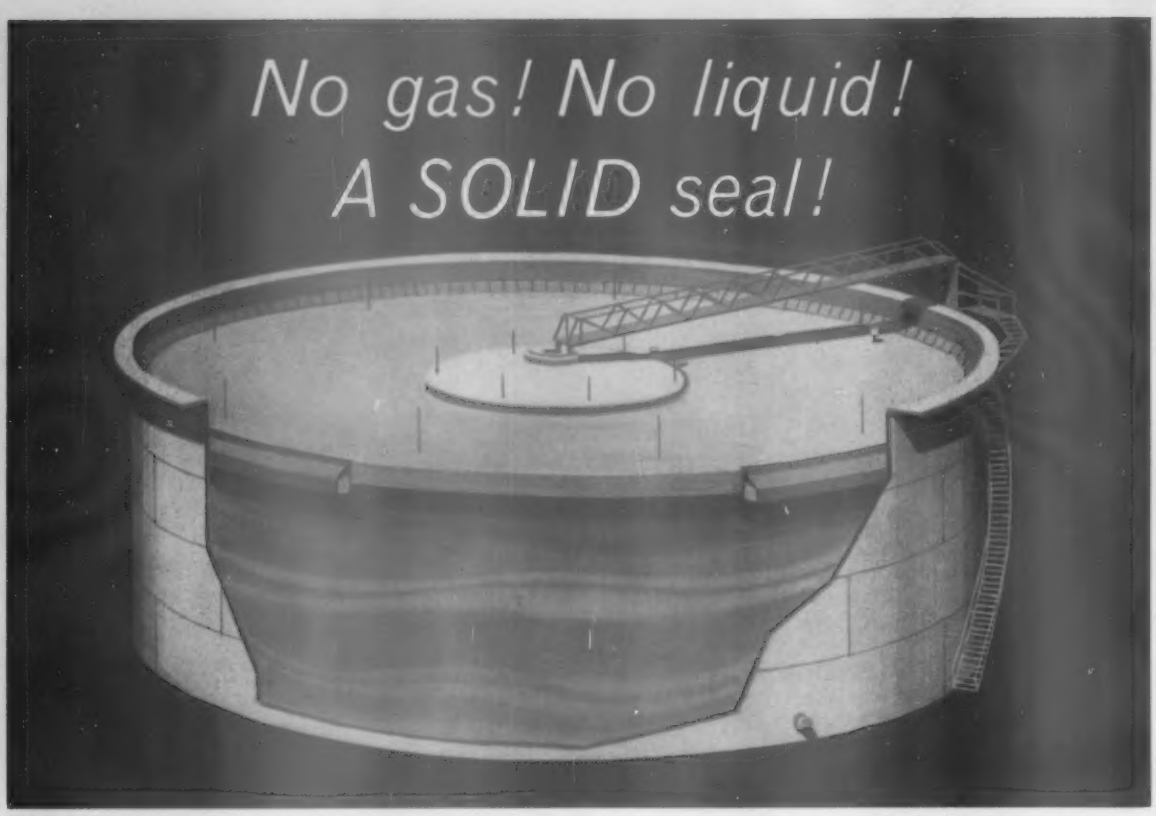
6242 West 66th Place • Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany

In Canada—Alchem Limited, Burlington, Ontario

nalco® **Serving Industry through Practical Applied Science**

Nalco CHEMICALS



nothing can disable

EverSeal*

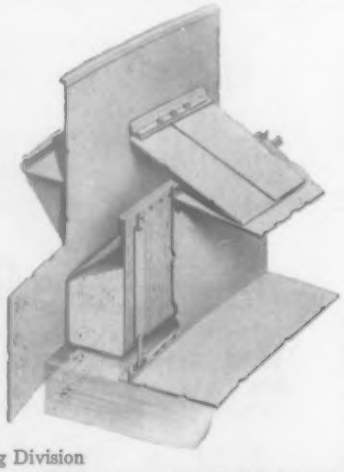
General American's new cushion seal for floating roofs

Tear it! Gouge it! Puncture it! The seal will hold. No matter what the damage, it will not burst or rupture! There's nothing in EVERSEAL to spill or leak.

Urethane cushions firmly joined and enclosed in a vapor-tight, no-scuff envelope of BUNA "N" and PVC are protected by the General American weather hood.

EVERSEAL resists the abrasive action of rough tank walls, yet will not scratch or damage tank coatings.

Get the complete details about EVERSEAL! Write the General American office nearest you. For any type of conservation structure, *it pays to plan with General American.*



WHY THE NEW GENERAL AMERICAN EVERSEAL IS FAR BETTER THAN ANY TUBE TYPE SEAL

1. No liquid or gas to leak
2. Replace entire seal or a section without taking roof out of service
3. EVERSEAL will accommodate a 10" variation in annular space between roof and shell
4. No moving parts—nothing to corrode
5. Costs less than most other seals
6. Permits full travel of roof, yet rides easily over projections on shell and maintains seal
7. Protected from sun, rain, snow and dirt by the General American weather hood
8. Eliminates buildup of vapors in seal area
9. Will not freeze to sides of tank
10. Provides full protection for oxygen-sensitive stocks

*Patents Pending

Plate & Welding Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street, Chicago 3, Illinois • Offices in Principal Cities

THE HOMCO WASHOVER BACK-OFF CONNECTOR RECOVERS THE PIPE

HOMCO
Fishing, Cutting and Electrical Well Service

Affords less rig time

Aids in the recovery of more pipe

Safe
Economical
Dependable

The HOMCO Washover Back-Off Connector is designed to safely increase the rate of recovery of stuck drill pipe or tubing in washover operations.

The basic function of the connector is to enable the operator to washover and back-off with the string shot, recovering the "fish" with one round trip of the drilling string, thus saving rig time.

On an actual fishing job, through the use of the HOMCO Washover Back-Off Connector and HOMCO String Shot, only seventeen trips were necessary to recover 9,188 feet of pipe. A total of 207 hours of rig time was used. Without the use of the HOMCO Washover Back-Off Connector and String Shot a total of 34 trips would have been required and 412 hours of rig time would have been used to accomplish the same job.

research
engineering
development
manufacturing

HOMCO
HOUSTON OIL FIELD MATERIAL COMPANY

WORLD'S LARGEST INDEPENDENT DIVERSIFIED SUPPLY AND SERVICE ORGANIZATION

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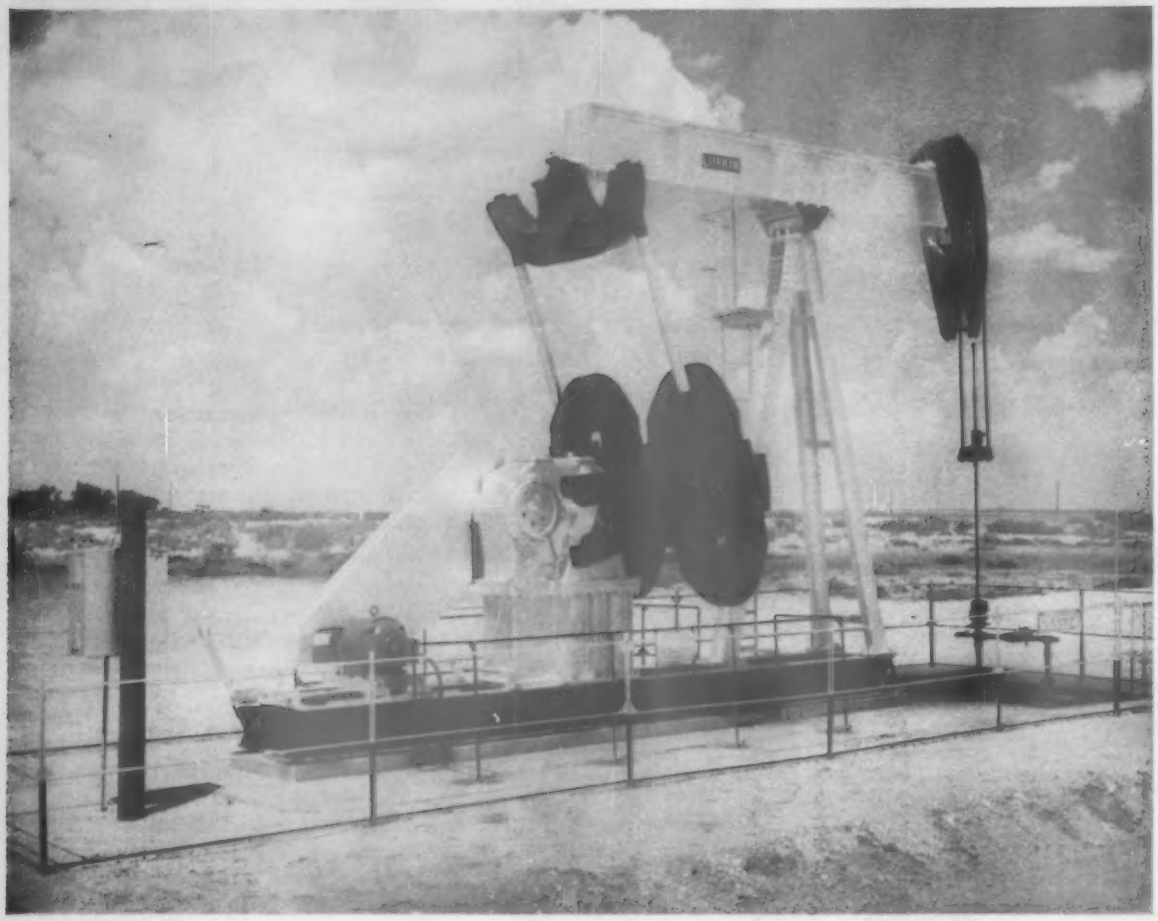
PARIS, FRANCE

WRITE FOR TECHNICAL BULLETIN NO. 27-1-1

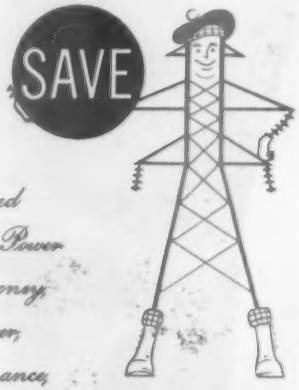
You can depend on purchased electric power for

ECONOMICAL OPERATION



Producing well in West Texas using low cost purchased power and automatic control

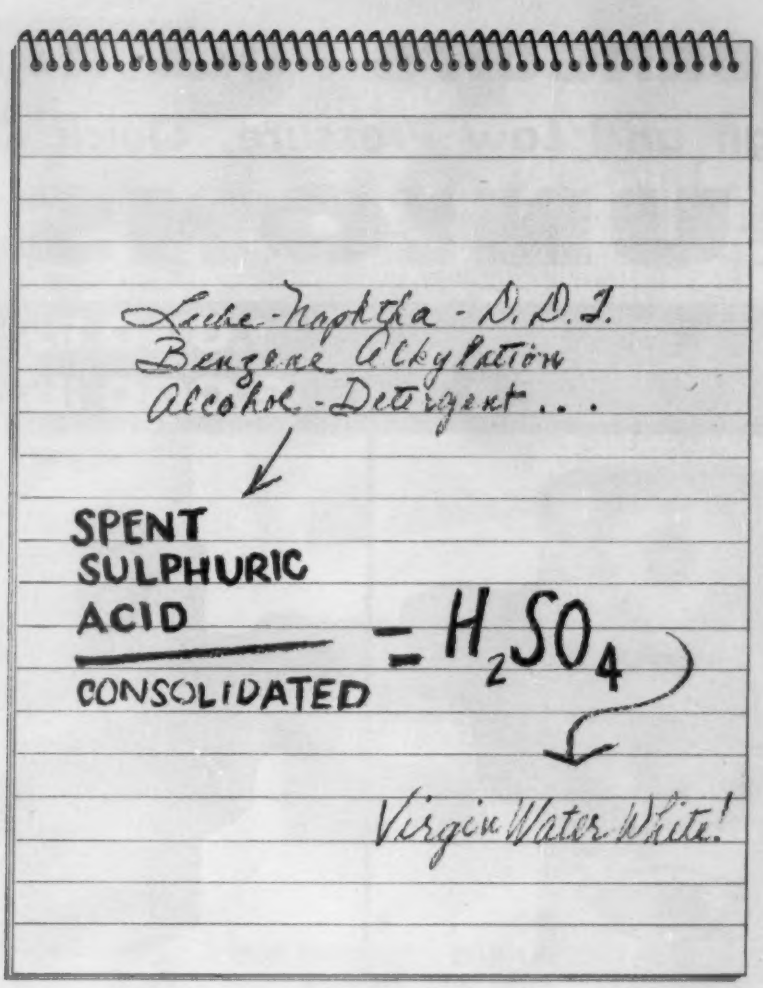
Producing fields that use utility electric power give the utmost in operating economy . . . this is one of the thousands of wells producing as required with lowest possible operating cost. If you want more from your production, gathering, pipelines or refineries . . . use and *depend* on purchased electric power. Call your nearest utility electric power company for details.



Purchased Electric Power saves money, manpower, maintenance, and serves you better automatically

Petroleum Electric Power Association

P. O. BOX 35006, DALLAS 35, TEXAS



Send your spent sulphuric acid through Consolidated and get it back as water-white H_2SO_4. Normally we deliver 99% but you can have it to a fraction of a percent . . . tailor-made for your plant process as delivered.

Spent acid shipments and acid deliveries by truck, tank car or barge—yours or ours—to or from our regeneration plants at Houston and Baytown, Texas, Baton Rouge, La., Hammond, Ind., and Dominguez, Cal.

Consolidated transportation facilities are an advantage, too. We have a large fleet of barges and tank cars and an exceptionally fine traffic department. Movements are traced day by day . . . deliveries are prompt and reliable.

Sulphuric acid is also shipped from other plants at Fort Worth and Corpus Christi, Tex., LeMoyne, Ala., Vernon and Richmond, Cal., and Tacoma, Wash.

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380 Madison Avenue, New York 17, New York

Prudential Plaza, Chicago 1, Illinois — 636 California Street, San Francisco 8, California

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GUIBERSON'S FULL RANGE
of High and Low Pressure, Quick Change
UNIONS

1,000 lb. test
2,000 lb. test

4,000 lb. test
6,000 lb. test
10,000 lb. test
15,000 lb. test

Quick and easy to make or break, Guiberson's Unions are ideal for a multitude of uses... give a positive, leakproof seal, with minimum upkeep. Guiberson's low pressure unions 1" through 10" sizes have metal to metal seats, feature a convenient 3-lug wing nut.

High pressure unions are made in 1" through 4" sizes. 6,000 lb., 10,000 lb. and 15,000 lb. unions incorporate the pressure-molded Seal-O-Matic Ring. All high pressure unions are forged steel.

SAFE THAN SORRY GUIBERSON BETTER BE

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919 — DALLAS, TEXAS U. S. A.

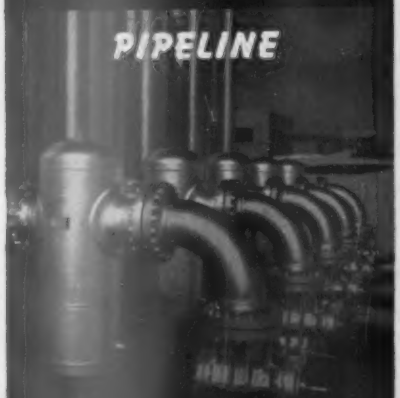
PRODUCTION

Pictured above is a Peerless Line Separator removing moisture from fuel to drilling rig.

REFINING

These two Peerless Line Separators are doing an efficient job of mist extraction in the Petrochemical plant in Kentucky.

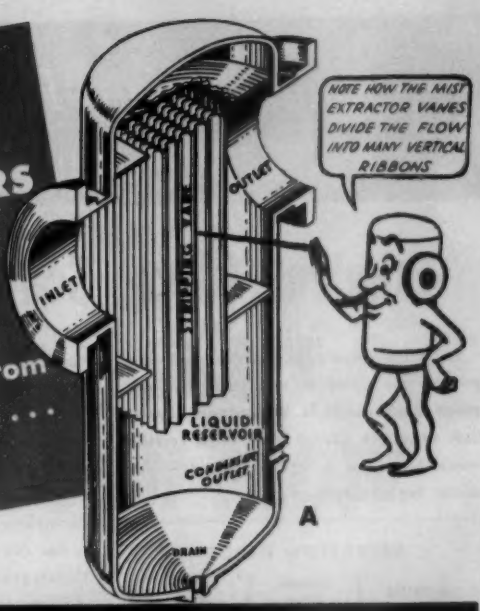
PIPELINE

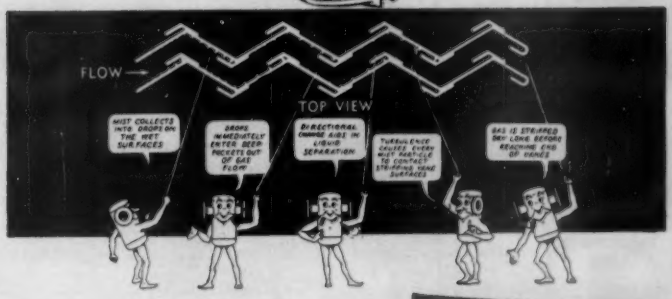


FIVE Peerless Line Separators are shown above as they handle carry over from large scrubbers.

PEERLESS LINE SEPARATORS

Outstanding for the efficient extraction of liquid mist from gas or steam . . .




B
FLOW
TOP VIEW
MIST COLLECTS INTO DROPS ON THE WET SURFACES
DROPS IMMEDIATELY ENTER DEEP POCKETS OUT OF GAS FLOW
BI-DIRECTIONAL CHANGE SIDE IN LIQUID SEPARATION
GAS IS STRIPPED DRY LONG BEFORE REACHING END OF VANES

HIGH EFFICIENCY — HIGH CAPACITY LOW PRESSURE DROP

Thousands of installations throughout the oil industry . . . production, pipeline, refining and petrochemical . . . prove the Peerless Line Separator principle to be one of the most outstanding methods available for the extraction of liquid gas, steam or air.

Drawing A above shows the arrangement of the vanes in the Separator. Drawing B is an illustration of the Peerless Principle.

The mist extractor combines the forces of impingement, centrifugal motion and surface tension to obtain its high efficiency. The path of the gas, etc., through the unit is constantly bending causing semi-violent turbulence and rolling of the gas against the walls of the vane. Impingement and centrifugal force combine to contact the droplets with the vanes, where they coalesce, and surface tension then causes them to cling to the vane's surfaces. Gravity and the impact of the gas steam then drive the droplets into the pockets where they roll down the vanes and out of the gas stream.

Through the Peerless method of mist extraction, the gas is stripped dry long before reaching the end of the vanes.

there's A PEERLESS SEPARATOR FOR EVERY REQUIREMENT

For any capacity
For any working pressure
For corrosive conditions
With removable vane units
With extra body length
With connections for accessory equipment
For pressure drop requirements of less than 6" water
For any vapor-liquid ratio
For any piping requirement

SPECIAL DESIGN SEPARATORS FOR ANY REQUIREMENT

FOR FURTHER INFORMATION ON THE USE OF PEERLESS LINE SEPARATORS PLEASE WRITE FOR NAME OF NEAREST PEERLESS ENGINEER.

PEERLESS MFG. CO.

"OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE"

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 ★ DALLAS 20, TEXAS ★ Fleetwood 2-8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Ethylene Glycol Scores High As Hydrate Inhibitor

In refrigeration-type gasoline recovery plants, the most widely used hydrate point depressant is diethylene glycol. But, ethylene glycol may offer certain advantages as a replacement in your plant, for example . . .

SELECTION GUIDE

ADVANTAGE	Ethylene Glycol	Diethylene Glycol
Hydrate Inhibition	GOOD	GOOD
Ease of Separation	BETTER	GOOD
Cost	LOWER	—
Vaporization Loss	LOW	LOWER
Solubility Loss	LOWER	LOW

HYDRATE INHIBITION

While both ethylene and diethylene glycol give good hydrate inhibition, with hydrate point depressions generally in the range of 60° to 80°F., reports indicate that ethylene glycol may give a greater depression in those cases needing very low separation temperatures.

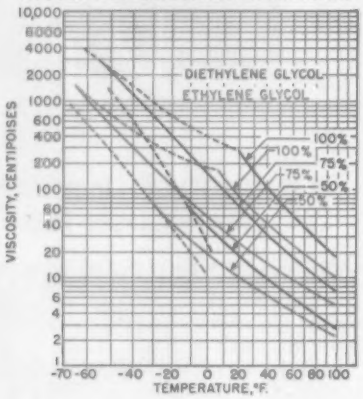
EASE OF SEPARATION

Ethylene glycol-water solutions are easier to separate at very low temperatures than diethylene glycol-water solutions.

This advantage is illustrated in the graph below. At 0°F. the viscosity of a 50 per cent ethylene glycol solution is 20 centipoises, or half the viscosity of the diethylene glycol solution.

An even more marked difference is shown at lower temperatures . . . at—40°C. a 75 per cent ethylene glycol solution has a 300 centipoises viscosity, as compared with 1000 to 2000 for a 75 per cent diethylene glycol solution.

VISCOSITY OF GLYCOL-WATER MIXTURES



COST

Ethylene glycol costs 1¾¢ a pound less than diethylene glycol which means a possible tank car savings of $1,300.

VAPORIZATION

Although ethylene glycol vaporization losses are greater than diethylene glycol's, the difference is insignificant below 30°F., if separator pressure is 750 PSI or higher.

SOLUBILITY

At separation temperatures of 60°F., glycol losses due to solubility should be in the range of 10 to 50 ppm when 50 to 75 per cent ethylene glycol solutions are used; and 20 to 100 ppm with equal strength diethylene glycol.

The higher volatility of ethylene glycol must be taken into consideration in regeneration equipment design and operation; but ethylene glycol may offer advantages in certain systems. Your CARBIDE Technical Representative can show you data on the pros and cons of ethylene or diethylene glycol hydrate inhibition in your system.

For a copy of a new report, "The Glycols as Hydrate Point Depressants in Natural Gas Systems" and a comprehensive bibliography of all the major articles published on gas sweetening and dehydration in the last 25 years, use the coupon.

UNION CARBIDE *is a registered trade mark of Union Carbide Corporation.*

UNION CARBIDE CHEMICALS COMPANY, Rm. 328, Dept. G, 30 E. 42nd St. New York 17, N.Y.

Please Send Me

- ☐ Technical data report—"The Glycols as Hydrate Point Depressants in Natural Gas Systems."
- ☐ 15-page Gas Sweetening Bibliography.
- ☐ Please have a CARBIDE Technical Representative call.

NAME: ..... POSITION: .....

COMPANY: .....

ADDRESS: .....

CITY: ..... STATE: .....

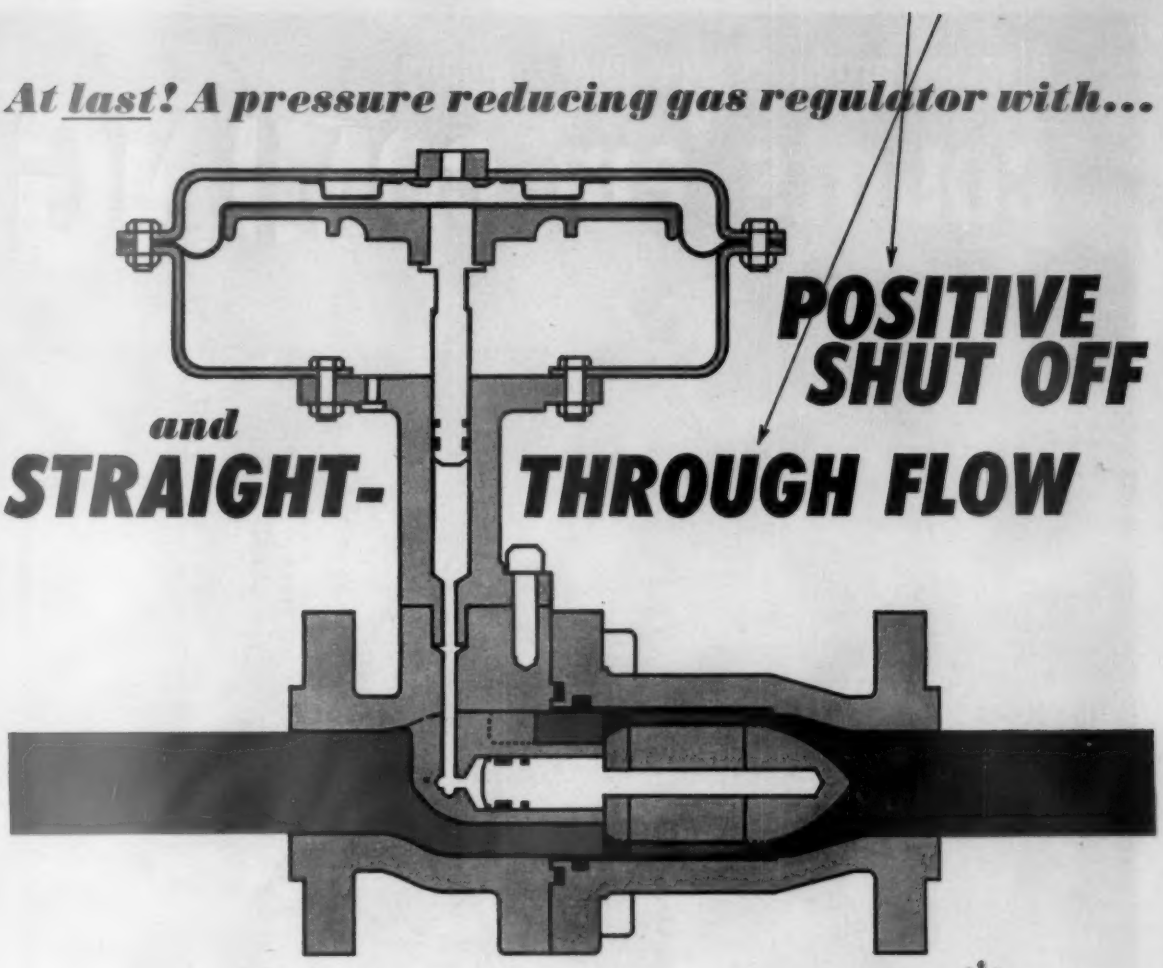
UNION CARBIDE CHEMICALS COMPANY

DIVISION OF

UNION CARBIDE

CORPORATION

At last! A pressure reducing gas regulator with...



POSITIVE SHUT OFF

and

STRAIGHT-THROUGH FLOW

The NEW Jet Stream Regulator *

Now you can stop high-speed gas turbulence, sound vibration, and leakage in your pressure regulators. The Jet Stream Regulator gives you straight-through laminar flow, positive shutoff, and no mechanical friction. Jet Stream's laminar flow stops the jetting of high speed gas and transient particles. This smooth straight-through flow also reduces sound vibration. Jet Stream's hydraulically actuated slave piston regulates flows with extremely fine control... from full flow to bubble-tight shutoff in three seconds. For efficiency and safety in your pressure reducing gas regulators... *use a Jet Stream Regulator!*

* *manufactured under the Welker Patent*

THE JET STREAM REGULATOR IS MADE IN THREE MODELS
• FLANGED • THREADED • INSERT

Write for the Jet Stream Catalog. A catalog giving complete specifications on the Jet Stream Regulator is available upon request.

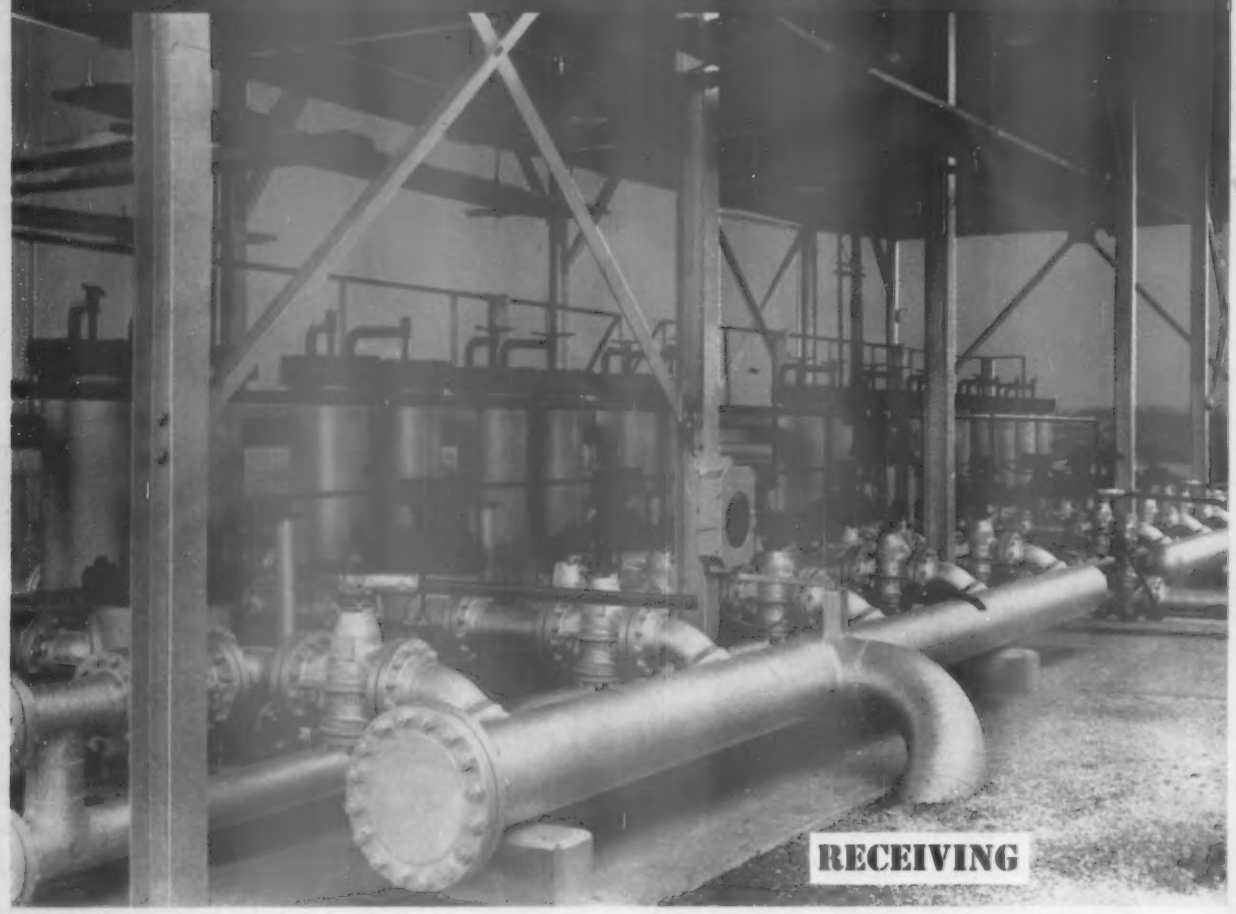
APCO DIVISION OF TEXTRON INC.

engineering • design • development • manufacturing

616-C WEST WHITTIER BOULEVARD • WHITTIER, CALIFORNIA • P. O. BOX 6965, HOUSTON, TEXAS

A major products pipe line company

counts 'em COMING



4-company oil "bank" keeps accurate ledgers on product deposits and withdrawals

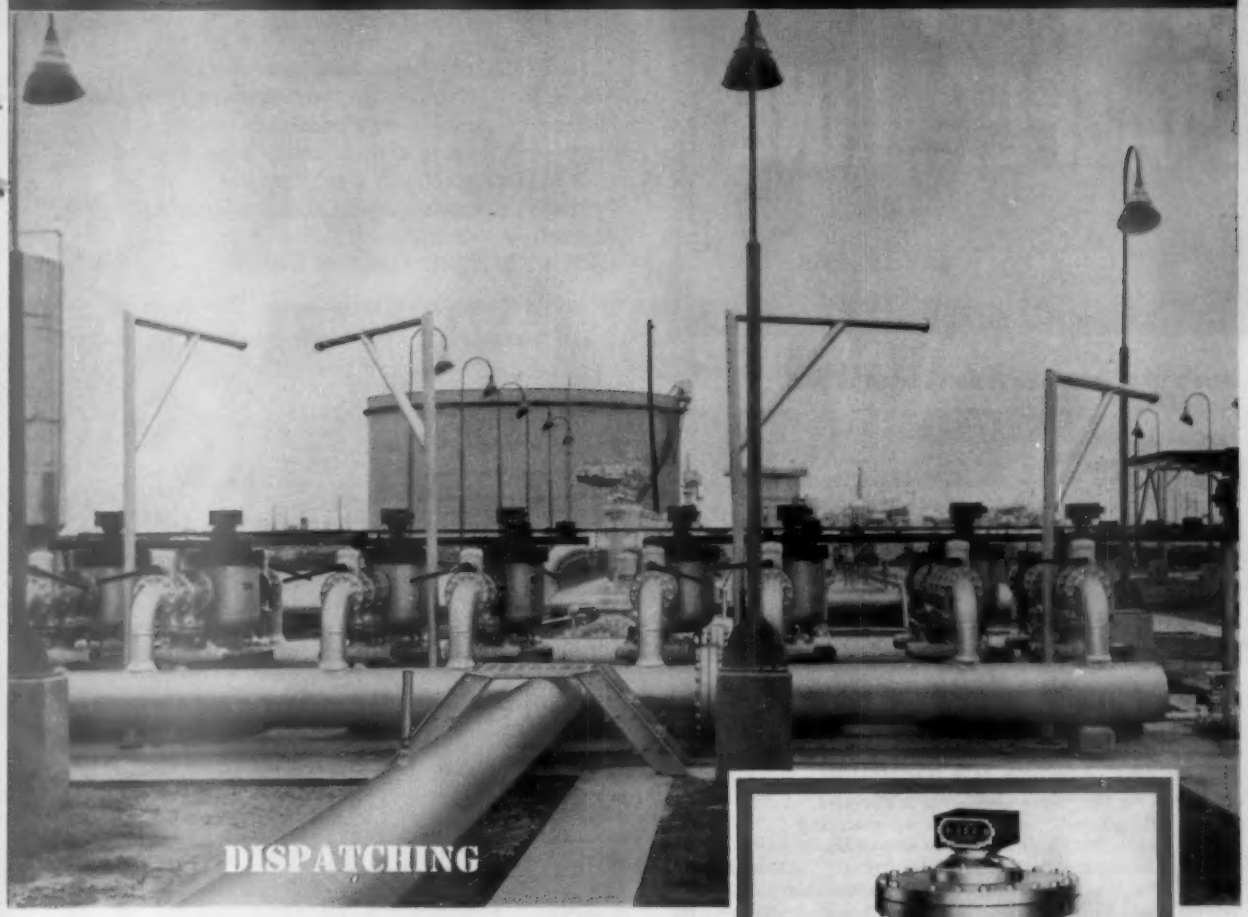
With four contributors working one terminal, accuracy is a must. And when this Gulf Coast installation was planned, the natural choice for keeping records straight was an A. O. Smith meter system.

The four lines feed through four separate A. O. Smith meter banks that register input within hundredths of a percent. A second set of meters measures and records individual deliveries from the product "pool" to the big 16-inch line.

This modern replacement for old-fashioned tank gauging permits truly automatic operation — essential at such a complex installation. A. O. Smith meters provide for minimum use of tankage . . . save costly manpower . . . cut evaporation losses too. Capacity is 170,000 barrels.

This Gulf Coast terminal is just one example of job-site benefits that can be duplicated for you by A. O. Smith. For more information, contact your A. O. Smith meter man or write direct.

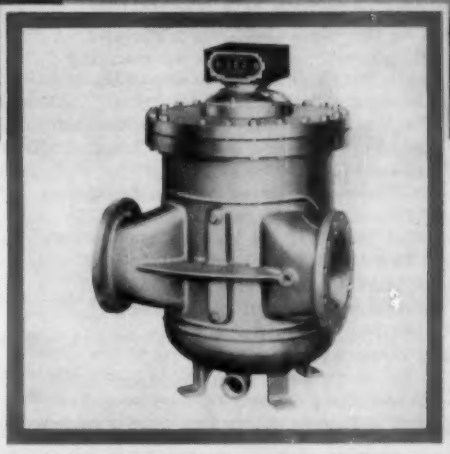
and GOING



A. O. Smith measures your needs — then recommends the metering setup that gives you the most accurate and economical service. Like this company, you can benefit by depending on A. O. Smith for meters.

Through research ...*a better way*

A.O.Smith
CORPORATION
Smith-Erie Division



Compact A. O. Smith positive-displacement line meters account for every drop and print a permanent record — automatically.

Factory: 1602 Wagner Ave., Erie, Pennsylvania. Offices: Atlanta 5, Ga.; Chicago 3, Ill.; Houston 2, Texas; Los Angeles 17, Calif.; New York 17, N.Y.; Oakland 21, Calif.; Tulsa, Oklahoma • Canada: Toronto 12, Vancouver 1 • A.O. SMITH INTERNATIONAL S. A., MILWAUKEE 1, WISCONSIN, U.S.A.

A NEW line of unit pumpers to cut your pumping costs

Continental-Emsco's API UNIT PUMPER LINE

ENGINEERED EVEN BETTER . . NOT JUST BUILT

Designed to conform with recent API proposed standards

After exhaustive tests, field pumping is a breeze for C-E units. So thorough are these tests that every possible well condition is duplicated . . every critical stress area checked with modern electrical strain gauges. Performance tests prove C-E's engineering reputation . . Engineered EVEN BETTER . . not just built.

Here's what these new features mean to you

HIGHER SAMSON POSTS . . increase operating efficiency through improved geometric design . . permit more efficient well counter-balancing. A maximum 1.06 torque factor has been attained by this design for all units.

MORE FLEXIBILITY . . 18 different units make it possible to apply the right unit to any well load for lower initial and operating costs . . a wide variety of stroke lengths is available for all pumping requirements . . any type of prime mover can be used to take advantage of gas or electricity, whichever is lower in cost.

IMPROVED LUBRICATION FOR GEAR REDUCER . . cast oil troughs distribute oil better, more thoroughly . . time-proven C-E features have been retained.

NEW WRIST PIN AND PITMAN CONNECTION . . Permits faster field assembly and speeds up changing stroke length. Pitman attaches to wrist pin bearing housing with through bolts. Tightening the bolts brings the parts together accurately and simply.

NEW BEARING ASSEMBLIES . . Pre-lubricated and sealed structural bearings eliminate contamination from field greasing (an optional feature). All bearing applications are based on manufacturer's B-10 life ratings.

QD SHEAVES, STANDARD . . available anywhere, these sheaves are lower in price than special sheaves.

STRUCTURAL CAPACITIES . . from 5,300 lbs. to 29,000 lbs. in 18 sizes. A unit pumper size for every well.

For Service that Sings . . Equipment that Hums . . Go . .

CONTINENTAL-EMSCO

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PT-902

CONTINENTAL EMSCO COMPANY • A Division of The Youngstown Steel and Tube Company • General Offices: Dallas, Texas
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Representatives in All Principal Oil Fields of the World

WELL	DEPTH	MAXIMUM INJECTION PRESSURE	PRODUCTION BEFORE SQUEEZE		PRODUCTION AFTER SQUEEZE		GAIN BBLS. /DAY
			BBLS. OIL/DAY	MCF GAS/DAY	BBLS. OIL/DAY	MCF GAS/DAY	
1	9642	4800	34	153	61	593	27
2	8381	3000	30	5	52	83	22
3	9640	3600	35	224	87	323	52
4	9625	4500	40	672	50	497	10
5	8484	3700	27	339	51	700	24
6	9652	3000	53	35	83	353	30
7	8397	5200	30	32	125	238	95
8	8408	3800	15	12	129	94	114
9	9310	3600	0	0	123	760	123
TOTAL			264	1472	761	3641	497

another
TRETOLITE SERVICE
report

9-well treatment program pays for self in 2 days!

TRETOLITE "SQUEEZE TREATMENT" DOUBLES OIL AND GAS PRODUCTION

The treatment of these nine wells was simple, effective and low in cost—about $300 to $350 per well for Tret-O-lite* demulsifying chemical plus pressure pumping truck and vacuum tank truck used to carry out treatment. Most of the wells were completed through tubing, with packers set above perforations. Several were dual completions, with two strings of tubing and producing zones separated by packer settings.

HOW TRET-O-LITE CHEMICAL DEMULSIFIER WAS USED

Sixty barrels of crude were mixed with 30 gallons of Tret-O-lite demulsifier. This mixture was pumped into tubing of each well, followed by enough crude to allow about 300 feet of oil-chemical mixture to stand in tubing. Each well was then shut in for 18 to 24 hours.

RESULTS OF TREATMENT

The table at top shows how effectively the Tret-O-lite demulsifier squeeze improved production in the 9 wells.

One day's gain in production in these 9 wells was such as to pay for cost of total squeeze job in about 2 days!

*Tret-O-lite is a registered trademark of Petrolite Corporation.

Tretolite products are helping to achieve similar savings for thousands of other producers. To find out how you can profit, *ask the Man in the Red Car.* Or write to . . .

TF59-2

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CORPORATION

TRETOLITE COMPANY
DIVISIONS
[illegible]

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ENGLAND: Petrolite Limited, 46 Mount Street, London W. 1.
VENEZUELA: South American Petrolite Corporation, Hotel Avila, Caracas

REPRESENTATIVES

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MEXICO: R. E. Power, Sierra de Mijes, No. 125, Mexico, D. F.
NETHERLANDS: F. E. C. Jenkins, Hoefbladlaan 134, The Hague
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THE MIGHTY-MITE IN WATER ABSORPTION

ANOTHER
PARKERSBURG
OUTSTANDING
ENGINEERING
ACHIEVEMENT

NEW SPHERICAL GLYCOL UNIT

Patents Pending

With a basketball-size* spherical absorber, Parkersburg's new Mighty-Mite represents one of the most **outstanding engineering achievements** in glycol dehydration history.

Field tests prove that a dew-point depression of 60° F. can be guaranteed, with dew-point depression as high as 100° F. not uncommon.

The Mighty-Mite is a skid-mounted, compact unit no larger than the top of an ordinary office desk.

MIGHTY-MITE Features:

- Reduced purchase, operation and maintenance cost.
- Simple, trouble-free operation.
- Ideal for off-shore operations because of its light weight, space-saving size.

*** for 3 mm. cu ft./DAY CAPACITY.**

THE PARKERSBURG RIG AND REEL CO.

THE
PARKERSBURG
RIG AND REEL COMPANY
Division of Parkersburg-Aetna Corp.

HOUSTON • TULSA • PARKERSBURG

See Your
PARKERSBURG
Man Today!

DU PONT *Petroleum Chemicals* NEWS

Number 99 in a Series of Bulletins for the Petroleum Industry

NOVEMBER-DECEMBER 1959

New Du Pont Cartoon Movie Wins Friends for Refiners

MANAGER, CLEVELAND DISTRICT OFFICE

JOSEPH G. EVANS was recently appointed manager of the Cleveland district office of the Petroleum Chemicals Division.

Mr. Evans, a native of Franklin, Pennsylvania, was graduated from Texas A&M College with a bachelor of science degree in mechanical engineering and joined the Petroleum Chemicals Division of the Du Pont Company in December of 1951 as a sales service representative in Tulsa, Oklahoma. He was formerly associated with the Standard Stoker Company of Erie, Pennsylvania, as a development engineer, and later formed his own company handling specialized industrial and automotive lubricants.

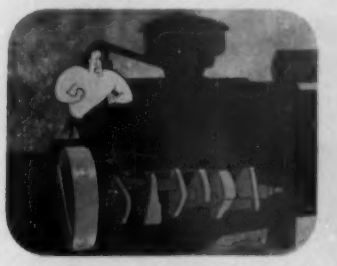
Mr. Evans spent five years as an officer aboard submarines and destroyers in the Pacific area during World War II.

Previous to his present assignment, Mr. Evans managed the San Francisco district office of the Petroleum Chemicals Division. He has had considerable experience with refinery problems especially in connection with the handling of tetraethyl lead and other additives. He is a member of the American Society of Mechanical Engineers and the API.

Remember Aladdin's genie? He had nothing on the mighty-muscled genie who waits to serve mankind today in each gallon of gasoline. Aladdin had only to rub his lamp. Today's motorist has only to say "Fill 'er up!"

For thousands of years "Gasoline" remained hidden underground, waiting for that day in 1859 when "he" would be released. Even then the need for his strength was slow to develop. In 1898 there were only 800 cars on the road. Today there are more than 70 million cars and trucks.

To give gasoline even stronger muscles for the big jobs it must do, it is torn apart and put together again by reforming, polymerization and alkylation. And, in spite of taxes of around 9¢ on every gallon, it is still one of our biggest bargains.



Today, gasoline not only keeps car wheels turning, but also supplies the power for braking, for steering, for lighting the road, for blowing the horn, for radio music and news, for air conditioning . . . even for lighting a cigarette and activating power seats and power windows.

"Gasoline is one of today's biggest bargains" is the message left with the viewers of Du Pont's newest cartoon movie, "Fill 'Er Up!" Subtle, yet hard-hitting, it makes the point to your audience simply and unmistakably. It does an effective public relations job for you when shown to employees or local school, social and civic groups.

The story of oil progress and, by implication, your part in it is told entertainingly. As important as the story it tells, though, is the fact that it leaves your audiences with a warm and friendly feeling toward you as the sponsor as well as toward the whole oil industry. It leaves them with a new realization and appreciation of the important role played by the genie who comes from a gasoline pump—instead of a lamp. And it does all this in 12 minutes!

Prints for your use are available at partial print cost or on extended loan through your Du Pont Petroleum Chemicals representative, or write to E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

Petroleum Laboratory Facilities Expanded

Progress invariably involves change.

So you'll find some changes being made at the Du Pont Petroleum Laboratory at Deepwater, N. J. We are adding facilities so that we can keep pace with the increasing needs of the industry. Our intention is to improve the nature and scope of our service to customers.

These pictures will give you some idea of what has taken place.

Among the new facilities at our Petroleum Laboratory is this single-cylinder test engine room. You will find six engines, complete with the newest instrumentation, here.

Special projects, often undertaken in behalf of a customer, get the full attention of senior staff members who have ample room and facilities to work with their assistants in a new series of private labs recently added to the main Petroleum Laboratory.

Building a Flare Stack? How High Is "High Enough?"

How to figure ground level concentrations of toxic gases if the flare should be extinguished, where and when they might occur under different weather conditions are included in this important paper by F. T. Bodurtha, Jr.

Mr. Bodurtha is consulting engineer with the Engineering Service Division of Du Pont's Engineering Department. He consults on air pollution problems for existing and proposed new plants.

"Flare Stacks—How Tall?" discloses the latest and most reliable methods for computing stack heights needed for adequate disposal of contaminants with or without flaring, and taking into consideration such essentials as velocity of flare gases, thermal rise, wind speed, density, and surrounding topography.

A reprint of this paper, which appeared in the December 15, 1958 issue of *Chemical Engineering*, can be obtained by writing Petroleum Chemicals Division, E. I. du Pont de Nemours & Company (Inc.), Wilmington 98, Delaware.

New TEL Sidetrack for Philadelphia Area

The latest TEL sidetrack is on the Pennsylvania Railroad at Philadelphia. Deliveries from it will be made at any hour, day or night, to meet your emergencies or sudden needs.

Like the other 22 emergency shipping points, it will keep ample supplies of both motor and aviation mix on hand. For less-than-tank-car quantities, order from the truck terminals at Carneys Point, N. J.; Antioch and El Monte, Calif.; Beaumont, Texas; and Ferndale, Wash. For more information, contact your nearest sales office.

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Cleveland 15—101 Prospect Ave.....MAin 1-3422
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Los Angeles 17—612 So. Flower St.....MAdison 4-1354
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Philadelphia 2—3 Penn Center Plaza.....LOcust 8-3531
Pittsburgh 22—1 Gateway Center.....ATlantic 1-2933
San Francisco 4—111 Sutter St.....EXbrook 2-1934
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In Canada—Du Pont of Canada Limited, Petroleum Chemicals, 85 Eglinton Ave. East,
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Better Things for Better Living
. . . through Chemistry

Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-12207

Printed in U.S.A.

New UC-263 with 82 max. hp. rating @ 2400 on LPG.

New UC-221 enclosed power unit develops 60 max. hp. @ 2400 rpm. on natural gas.

Two NEW heavy-duty International 6-cyl. engines cut pumping costs

Two new 6-cylinder heavy-duty engines in the 75-95 max. hp. class, the UC-221 and UC-263, have been added to the line of International oil field engines that protect production and cut pumping costs.

Both the UC-221 and UC-263 carbureted engines have inherent diesel ruggedness. This is because each differs from an interchangeable diesel engine in the International line principally in cylinder head and piston sections. Features contributing to smooth, efficient, economical power include: valve-in-head design; best compression ratio for selected fuel; low-friction stepped-dome pistons; replaceable cylinder sleeves; fully machined combustion chambers for uniform power from each cylinder; and 12-volt electrical system.

Attachments that adapt either engine to your oil field needs include; fuel attachments for natural gas, combination natural gas and gasoline, and LPG; exhaust condensor, top cylinder oiler, automatic safety shut-off; automatic radiator shutter, horizontal high tension magneto and gear-driven mechanical governor.

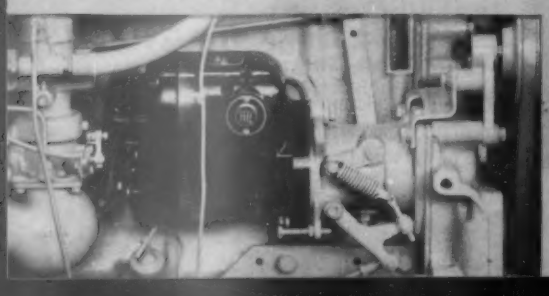
For any pumping, compressor station, or drilling power requirement, check your International Power Unit Distributor or Dealer. He sells and services carbureted and diesel engines from 16.8 to 385 max. hp. that you can depend on for lowest cost operation.

INTERNATIONAL®
IH ENGINES

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

Mechanical governor and horizontal magnetos are available on all IH oil field engines.



Oiler lubricates piston rings, valves through intake manifold.

Condensor reclaims moisture in exhaust gases and returns it to engine's cooling system.

Nightview of UOP Fluid Catalytic Cracking (left) and "HF" Alkylation units at Leonard's Alma (Mich.) refinery.

UOP Fluid Cat Cracker boosts production of gasoline and quality distillates

Platforming and Udex units produce high quality aromatics for Michigan's petrochemical industries.

Leonard upgrades blending stocks with new UOP Fluid Catalytic Cracking and "HF" Alkylation units

by Reid Brazell
President
Leonard Refineries, Inc.
Alma, Michigan

The question has been asked of me frequently: What has motivated Leonard's growth as one of Michigan's most successful petroleum operations? It has resulted, mainly, from the challenge of the times. Each phase of our development has been chronologically prologued by conditions which have made advancement imperative.

Reid Brazell

Early Improvement Increases Gasoline Yield 130%

Back in the mid-thirties, our chief problem as a newly formed company was to improve octane rating and consumer acceptance of Michigan refined gasoline, known then as the "bargain" gasoline. Low in price, it was also low in grade. Our first step was the installation of a then brand-new refining development, the UOP two-coil selective Thermal Cracking Unit—which enabled us to produce a more competive product and increase our gasoline yield from low-grade crude by 130%!

First "midget" UOP Polymerization unit provided 100-plus octane blending stock

The quality picture further improved immediately thereafter with the addition of one of the world's first "midget" Catalytic

Polymerization units. It went on stream at our Alma refinery and provided 40 BPSD of 100-plus octane blending stock and permitted Leonard to market an 80-octane gasoline.

Post-War Opportunities Foster New Facilities

The end of the war triggered another surge of growth by Leonard. First, a small catalytic cracking unit added another 3,000 BPSD of quality product to our output and this unit was later revamped to up capacity to 7,000 BPSD. An LPG plant was completed, a vacuum unit went on stream, treatment plants were completed and 648,000 barrels of tankage was erected.

Expansion took another giant step in 1955 with Leonard's acquisition of Mid-West Refineries and Roosevelt Oil & Refining Corp. A 1,200 BPSD UOP Udex® unit, tied into Roosevelt's catalytic reformer, increased Leonard's petrochemical business, enabling us to produce quality benzene and toluene for sale as chemical intermediates and solvents.

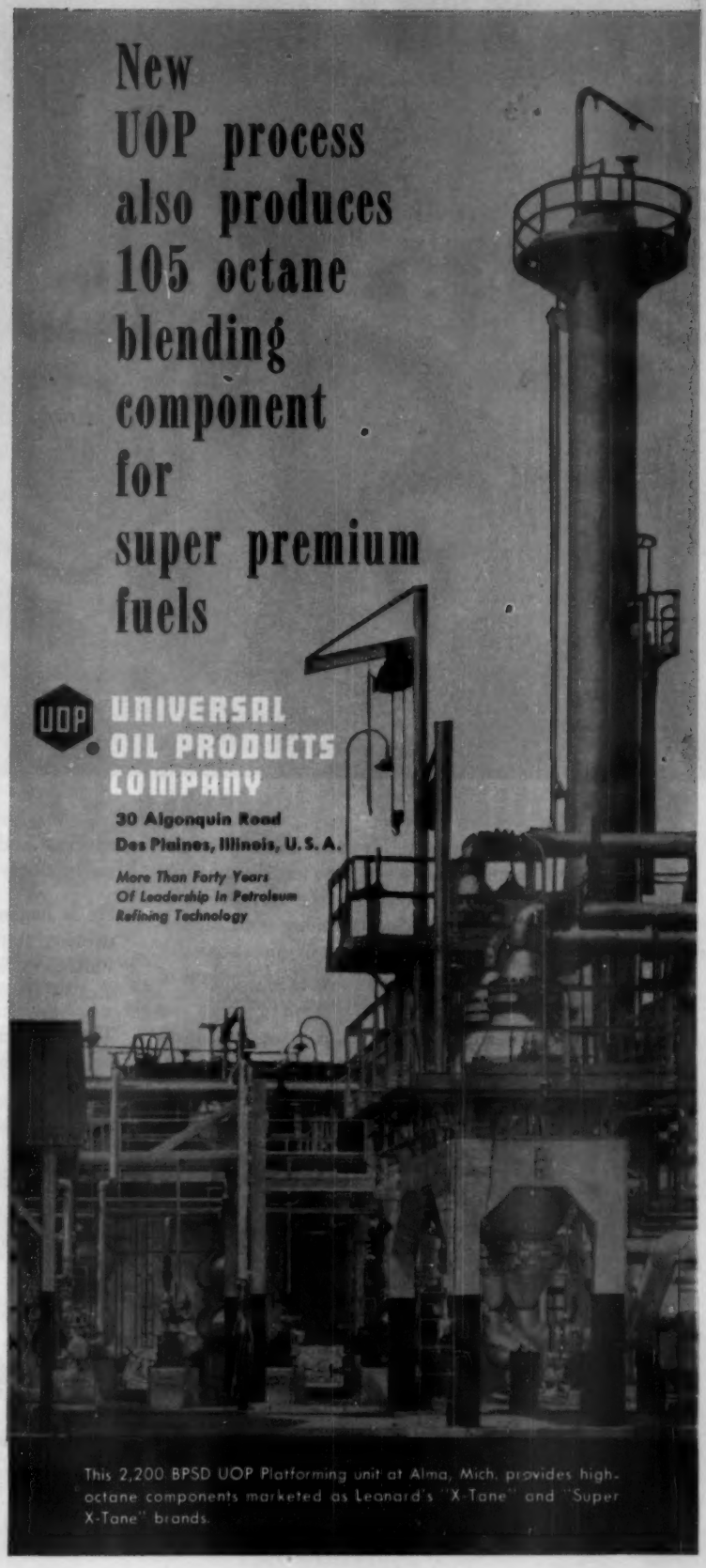
Fluid Catalytic Cracking, and "HF" Alkylation Units Added

Another "changing condition" took place in 1958 when construction of natural gas pipelines into Michigan cut into the demand for residual fuel oils. With our gasoline and domestic heating oil sales up, but industrial fuel oil sales down, we added a 7,500 BPSD UOP Fluid Catalytic Cracking unit to reduce residual stock and produce more gasoline and quality distillates.

Simultaneously, a 1,100 BPSD "HF" Alkylation unit, designed and licensed by Universal, went on stream at our Alma refinery. Producing a 105-octane blending component, the unit made possible a super-premium fuel of more than 100-octane.

Today, Leonard's refineries total nearly 30,000 barrels per day of crude capacity. With a broad range of facilities encompassing UOP Catalytic Cracking, Vacuum Distillation, UOP Platforming®, Thermal Cracking, Udex extraction, "HF" Alkylation, Platreating* and Catalytic Polymerization, we stand ever watchful of "The Conditions of the Times" as a stimulus for future growth.

*Trademark



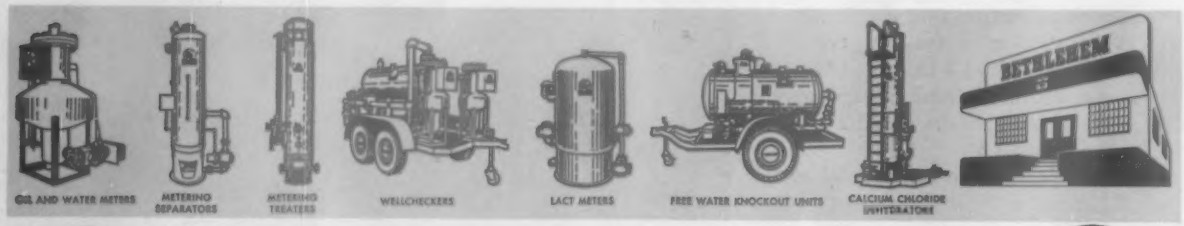
This 2,200 BPSD UOP Platforming unit at Alma, Mich. provides high-octane components marketed as Leonard's "X-Tane" and "Super X-Tane" brands.

He knows Rolo equipment. He can show you the advantages of continuous well data made possible through individual well metering. He can prove to you the economies of combining metering with separation or treating, in one vessel. He can also acquaint you with the many advantages of the Rolo method of natural gas dehydration using calcium chloride.

This Bethlehem representative is one of many specially-trained men who can provide you with engineering and application data on Rolo equipment as well as sales and service assistance.

He is backed by Rolo's own sizeable sales and engineering staff and by over 200 sales and service representatives in Bethlehem's 53 Supply Division stores and sales offices throughout the United States.

The Bethlehem representative knows Rolo products. Let him show you how they can serve *you*.



BETHLEHEM STEEL

In the U. S., contact your nearest Bethlehem representative for information and prices on Rolo products. In Canada and for export, see below.

Rolo

BETHLEHEM STEEL COMPANY
SUPPLY DIVISION
General Offices: 21 E. Second St., Tulsa, Okla.

ROLO MANUFACTURING COMPANY
P. O. Box 22126, Houston 27, Texas
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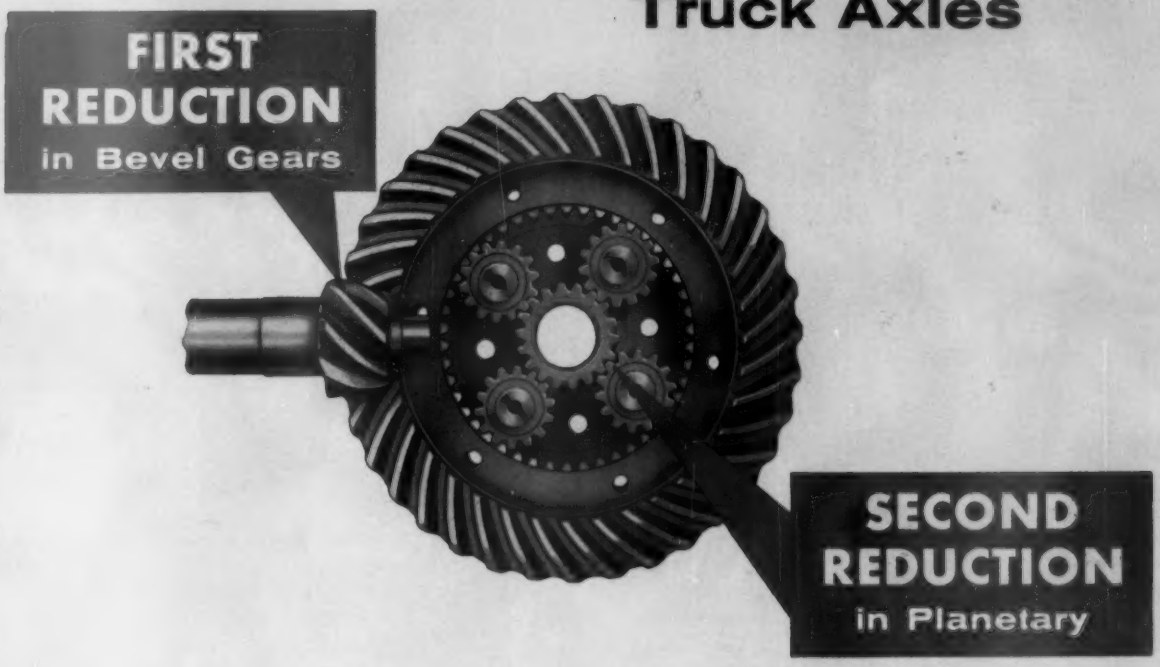
A New Concept in Double Reduction Truck Axles



Eaton Planetary Double Reduction

Gives You these Important Benefits!

Save Weight—Size for size, Eaton PDR Axles weigh less than conventional herringbone or spur gear axles, permit truckers to haul more legal payload.

Last Longer—In Eaton PDR Axles, gear tooth loads are equally distributed over four rugged "planet" gears; stress and wear are reduced, resulting in materially longer axle life. Eaton's forced-flow lubricating system provides positive lubrication to all moving parts, even at slowest vehicle speeds—a feature not available in other double reduction axles.

Cost Less to Maintain—When and if repairs are necessary, parts are readily available—most of them interchangeable with other Eaton Axles. Simple construction—similar to the famous Eaton 2-Speed Axle, with which all truck service men are familiar—holds maintenance labor to a minimum.

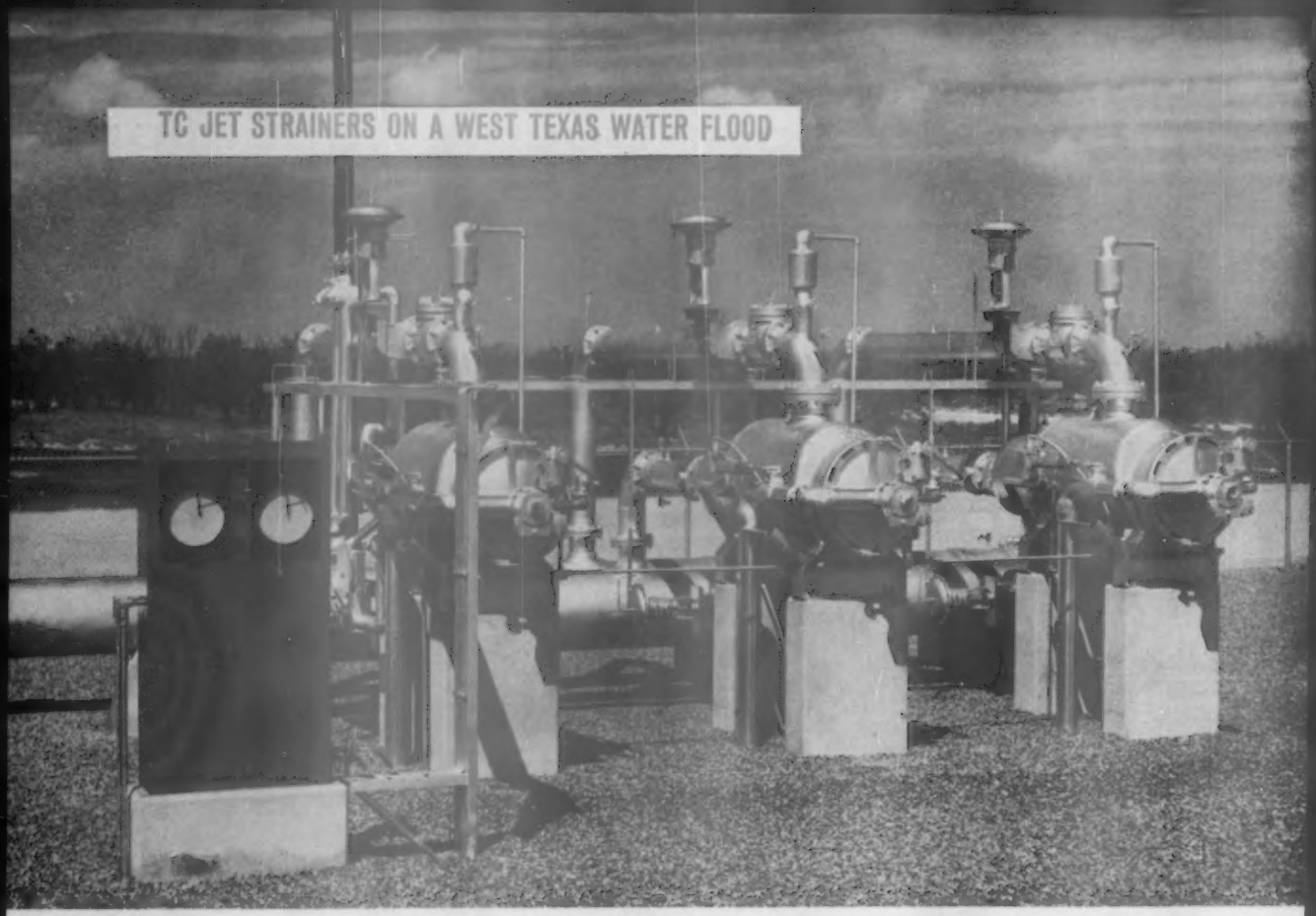
Previously, double-reduction axles have been available only in the extra heavy-duty sizes. Eaton PDR Axles are available in a wide range of sizes—the last word in equipment to meet the demands of today's hauling conditions. By actual comparison they cost less to buy, less to maintain. They have established outstanding performance records in all types of heavy-duty operation.

EATON

Ask your Truck Dealer for Complete Information about Eaton PDR Axles

EATON

AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND, OHIO



The One Sure Way to Clean Up Injection Flood Water

There's a big difference in water filtration equipment. Here, for example, are three small, compact, T-C Self-Cleaning Jet Strainers with a huge capacity for handling injection flood water. But best of all, these strainers require little attention, even less maintenance expense. In fact, their operation is fully automatic. They clean themselves when the baskets become dirty. At a predetermined pressure-differential across the basket, rotating jets go into action and scour the baskets clean. The entire cleaning operation takes only a few minutes.

T-C Jet Strainers are available in 10H, 20H and 30H sizes. 100, 200, and 400 mesh screens are interchangeable, depending on the particle size of sand and solids to be removed from the water. Extremely fine filtration, down to sub-micron particle size—including algae and bacteria—can be obtained easily with the aid of a diatomaceous earth coating on the basket.

If you attach importance to the cleanliness of your flood water—and most operators do—you should know all about T-C Jet Strainers. A brochure will gladly be sent on request.

An over-all view of a water filtration installation near Odessa, Texas. The three Model 30-H, T-C Self-Cleaning Jet Strainers are shown in the close-up above and at far right in this picture.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

New!

20 pages of helpful information about J-M Chempac Teflon products . . .

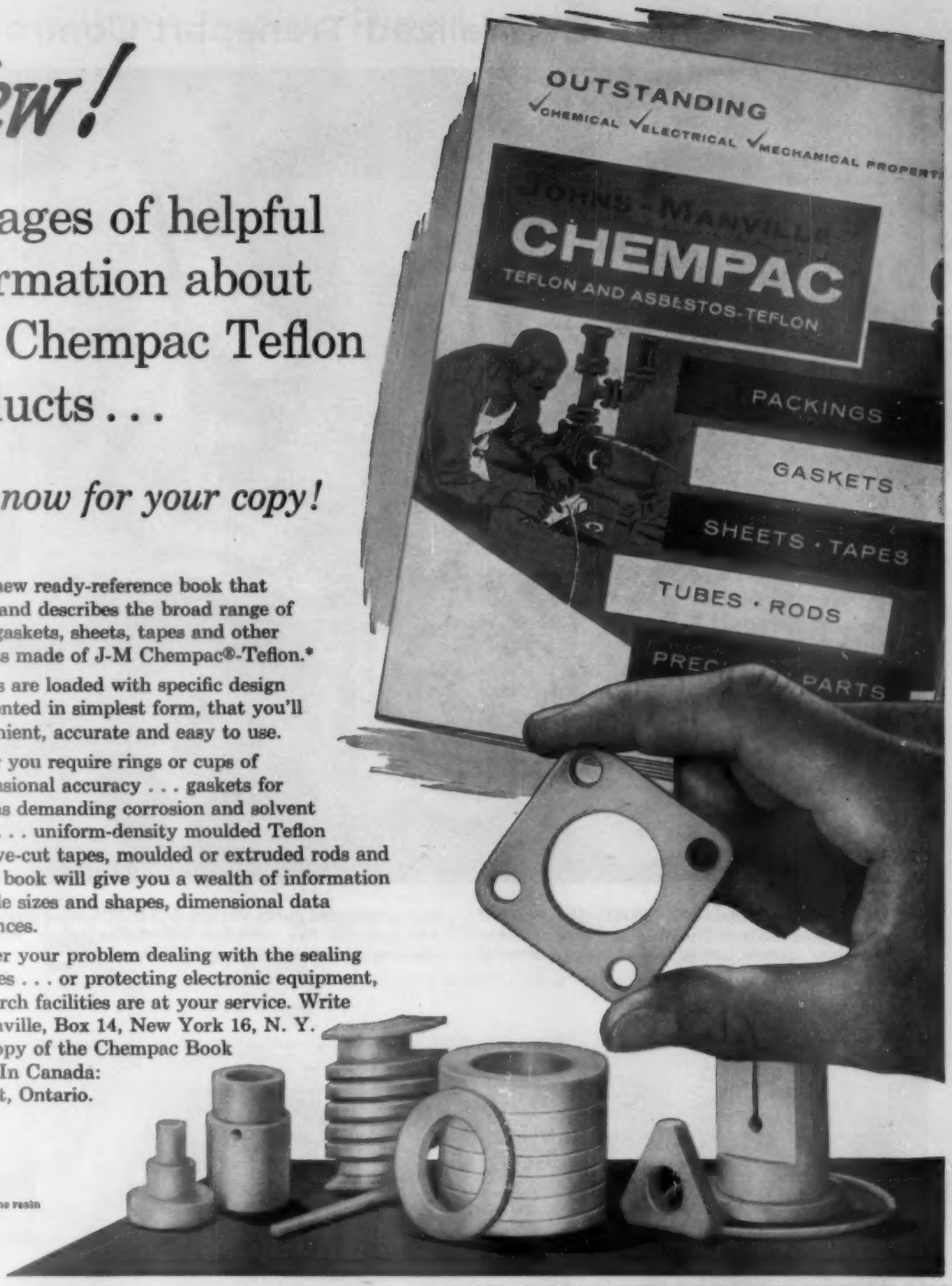
Send now for your copy!

Here's a new ready-reference book that illustrates and describes the broad range of packings, gaskets, sheets, tapes and other components made of J-M Chempac®-Teflon.*

Its pages are loaded with specific design data, presented in simplest form, that you'll find convenient, accurate and easy to use.

Whether you require rings or cups of high dimensional accuracy . . . gaskets for applications demanding corrosion and solvent resistance . . . uniform-density moulded Teflon sheets, skive-cut tapes, moulded or extruded rods and tubes, this book will give you a wealth of information on available sizes and shapes, dimensional data and tolerances.

Whatever your problem dealing with the sealing of corrosives . . . or protecting electronic equipment, J-M Research facilities are at your service. Write Johns-Manville, Box 14, New York 16, N. Y. for your copy of the Chempac Book PK-124A. In Canada: Port Credit, Ontario.



*TM for DuPont Tetrafluoroethylene resin

JOHNS-MANVILLE

Johns-Manville, Box 14, New York 16, N. Y.

Please send me a free copy of the new Chempac-Teflon Brochure, PK-124A.

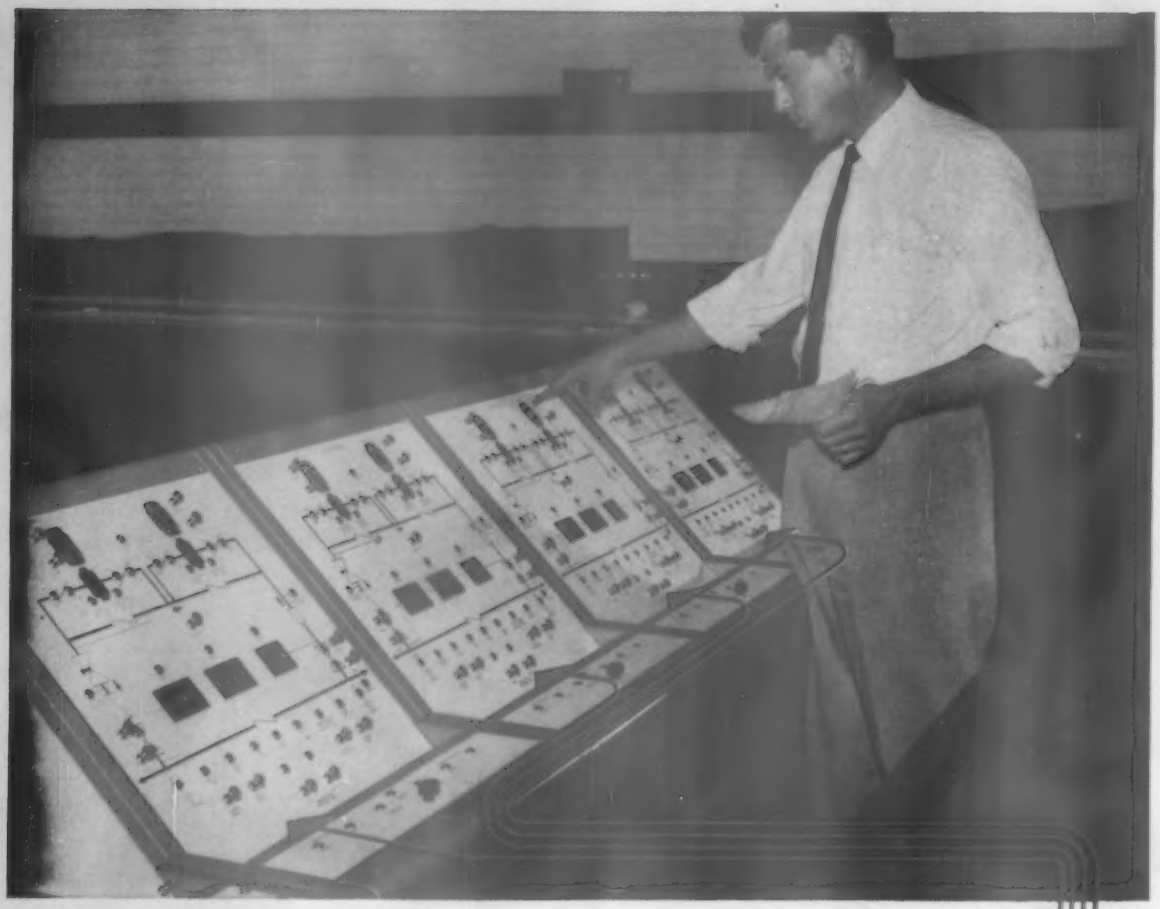
Name_____

Company_____

Title_____ Address_____

City_____ Zone____ State_____

Union Centralized Transport Control pays



LOS ANGELES CONTROLLING OFFICE—The heart of the whole operation is in Los Angeles where one man at the control console can supervise the operation of four unattended pump stations 643 to 804 miles away. The operator has complete information before him showing conditions all along the line.

PHOENIX
Output Terminal

TUCSON
Output Terminal

APACHE
Unattended Booster Pump Station

REMOTE CONTROL—Either pumping unit at any one of the four booster stations can be started or stopped from Los Angeles. The sequence in opening and closing valves and starting and stopping pumps is all handled automatically and correctly by the control system.

off for Southern Pacific Pipe Lines

Push a button in Los Angeles and four pump stations throb into action out on the desert over 600 miles away

Union Switch & Signal equipment controls operating sequence and telemeters operation of 33,000 bbl/day products line

FLEXIBILITY and fail-safe operation are the keynotes of the new pipeline system operated by Southern Pacific Pipe Lines, Inc. The line is used to transport refined products such as gasoline, jet fuel, diesel oil, etc., from El Paso, Texas, to Tucson and Phoenix, Arizona. All Centralized Transport Control equipment for four unattended booster stations was supplied by Union Switch & Signal.

REMOTE or LOCAL: All four booster stations are normally controlled from Los Angeles. Any station can be controlled locally, when desired. In any case, continuous pressure and suction readings are displayed on the console at Los Angeles and automatically recorded every fifteen minutes by an automatic typewriter. Any malfunction, at any point in the system, is indicated on the console. The equipment affected is shut down automatically and cannot be started again until the trouble has been cleared.

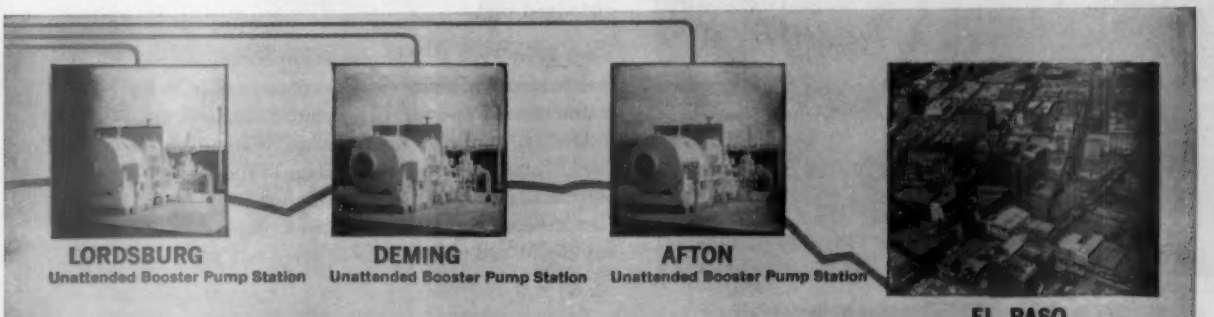
COMMUNICATION: Four telegraphic-type communications lines, owned by Southern Pacific, are used to transmit control codes to the stations and telemetered information back to Los Angeles. Each line serves one station. An additional commercial communications line serves as a stand-by for all four stations. Signals are coded to prevent noise or interference from causing faulty operation or indication.

MAXIMUM EFFICIENCY: The Centralized Control system, designed and installed by Union Switch & Signal Division of Westinghouse Air Brake Company, cuts down the chance for expensive error. It keeps the Southern Pacific Scheduling Department in Los Angeles informed, at all times, of exactly what is happening in the field. It speeds operation, adds security and reliability.

Union Switch & Signal has designed many successful custom systems for pipeline companies. And now out of that experience, it has developed standardized central control systems that cut costs, add flexibility, and save space, as well as making pipeline control extremely reliable.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA



LOCAL CONTROL—Operation also can be controlled automatically at the pump station. Or the station can be run manually. The choice is up to the local station. But Los Angeles always knows which mode of control is being used and always receives a continuous flow of system information.

THE FUTURE—Southern Pacific Pipe Lines, Inc. can already see opportunity to make this system more automatic and more efficient. They plan, in time, to be able to let stations adjust automatically to proper unit operation when an upstream or downstream station goes off the line.

Dirty Water can't "Shut-down"...

Vogt

film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441

River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

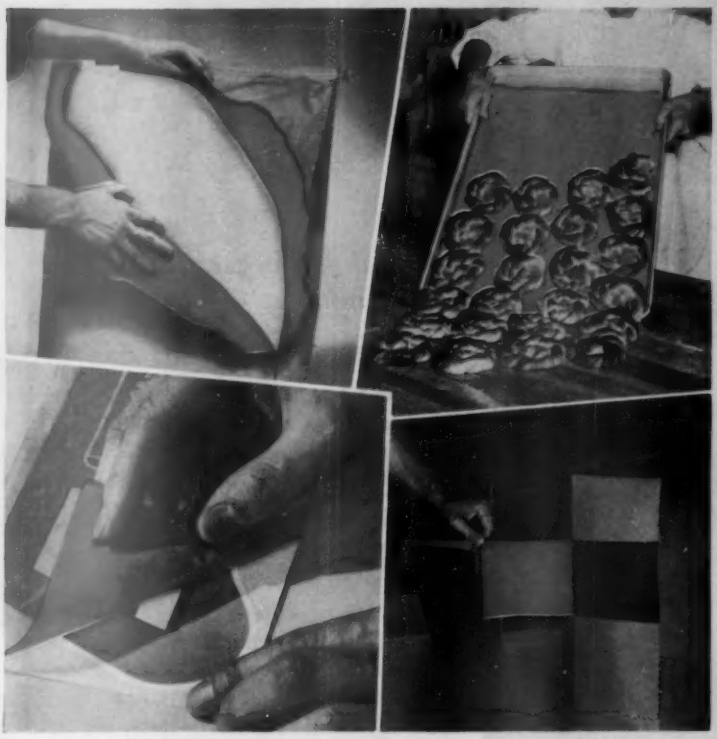
[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request. Dept. 24A-XO.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Sales Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, CAMDEN, N. J., ST. LOUIS, CHARLESTON, W. VA., CINCINNATI.

SILICONE NEWS from Dow Corning

Stuck With High Costs?



On Consumer Products . . . Syl-off coated papers mean more satisfied customers. As backing for self-adhering wallpaper, decorative trim, labels, or other pressure sensitive items, Syl-off coated papers peel free with ease . . . prevent tearing the item when the backing is removed . . . and have no effect on the pressure-sensitive characteristics. As wrapping or interleaving for foods, or as pan liners for sticky candies and baked sweet goods, Syl-off coated papers leave no bits of wrapper clinging.

Products Pop Free from Paper Coated with SYL-OFF . . . New Processing, Packaging Aid Saves Money

If you make, handle, ship or receive sticky products, you'd be wise to look into the use of package liners, wraps, interleaving or backing papers coated with Syl-off* Dow Corning *silicone* coatings. They give amazing release!

Consider the higher production efficiency, lower maintenance costs and extra sales advantages that accrue. Eliminate sticking problems, and you speed up processing and handling operations . . . cut product waste right to the bone. Syl-off is comparable to conventional nonadhesive coatings in cost . . . but its lighter weight cuts shipping costs for coated paper.

Syl-off coated papers have been tested with more than 100 adhesive materials — tough stickers like asphalt, food products, glue, adhesives, unvulcanized rubber — and have been found to release quickly, cleanly time after time. Important, too, is the fact that Syl-off coatings don't in any way alter or contaminate products — and they last as long as the paper.

There are other important features besides controlled stick-proofness. For example, Syl-off coated papers have a natural non-oily lubricity. Water repellency is still another silicone feature imparted by Syl-off. Syl-off silicone coatings are also readily applied to foil or plastic film — impart the same desirable characteristics as they do to kraft, glassine, parchment and paperboard.

Best way to find out what type Syl-off coated paper can help you most is to get in touch with the fine houses that offer papers or containers with Syl-off coatings. Write to Dow Corning for the complete list of Approved Sources plus an informational brochure describing Syl-off paper coatings. Do it today. Address Dept. 2924.

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"And this industry has offered the opportunity to exploit the ideas from which come new products and goods that enrich our lives.

"From this 'freedom to develop' atmosphere have come literally thousands of oil end-products ranging from tooth brushes and fine fabrics to tires for your car. But this is only a part of the story. We dare not overlook, nor fail to credit, the thousands of people and the many companies whose engineering and research talents have played a major part in this developmental success—those who operate behind-the-scene, so to speak—those who furnish the equipment and services to drill and produce the oil and gas.

"I speak of the Manufacturing, Service, and Supply companies. A vital part of the oil industry, they provide equipment, processes, research and engineering skills that have helped make our industry what it is today . . . a free enterprise working for a better way of living for people the world over."

P.E.S.A.

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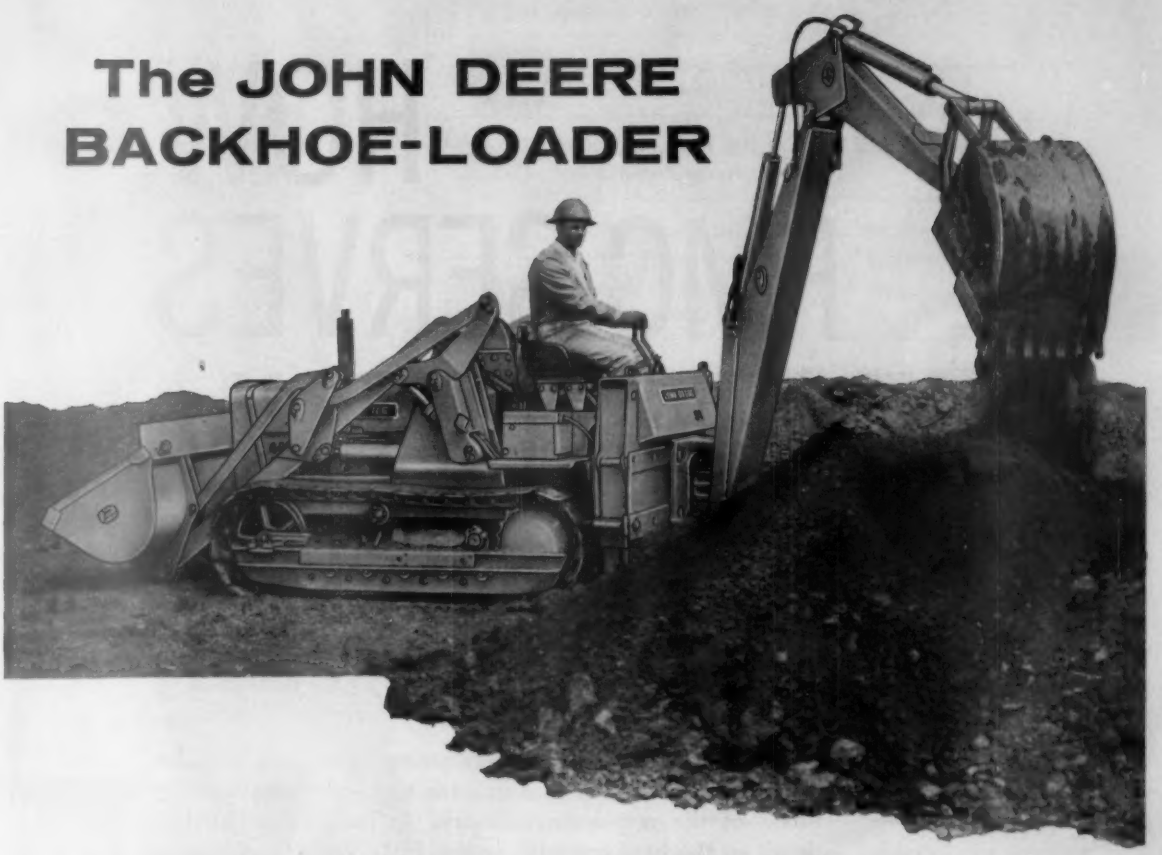
PROUD TO BE PART OF A PIONEERING INDUSTRY

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

Makes Old Cost Figures Obsolete...

The JOHN DEERE BACKHOE-LOADER



Here's the outfit that's cutting the high cost of excavating and trenching—giving many contractors and utilities a welcome break on construction expenses.

The 51 Backhoe combines fast, 2-lever digging with plenty of power and unusual flexibility. In minutes, one man on the job can set the boom-mounting to any of five positions from flush left to flush right, using only a wrench and the boom's own hydraulic power.

Self-leveling, the new 831 Loader gets the 7/8-yard heaped load into the truck fast—and with a minimum of effort. When the bucket is dumped from full height, it returns to digging angle by use of the *boom control only*. A 35-degree bucket roll-back provides 8500 pounds pry-out force for full loads.

For details, and a demonstration, see your John Deere Industrial Dealer. For specifications and illustrated literature, write the address below.

John Deere Industrial Division, Dept. 574, Moline, Ill.

The John Deere Credit Plan permits immediate ownership of the efficient equipment you need to cut costs now. All arrangements are made with the John Deere Industrial Dealer, in strict confidence.

JOHN DEERE *"Specialists in Low-Cost Power with a Heavyweight Punch"*

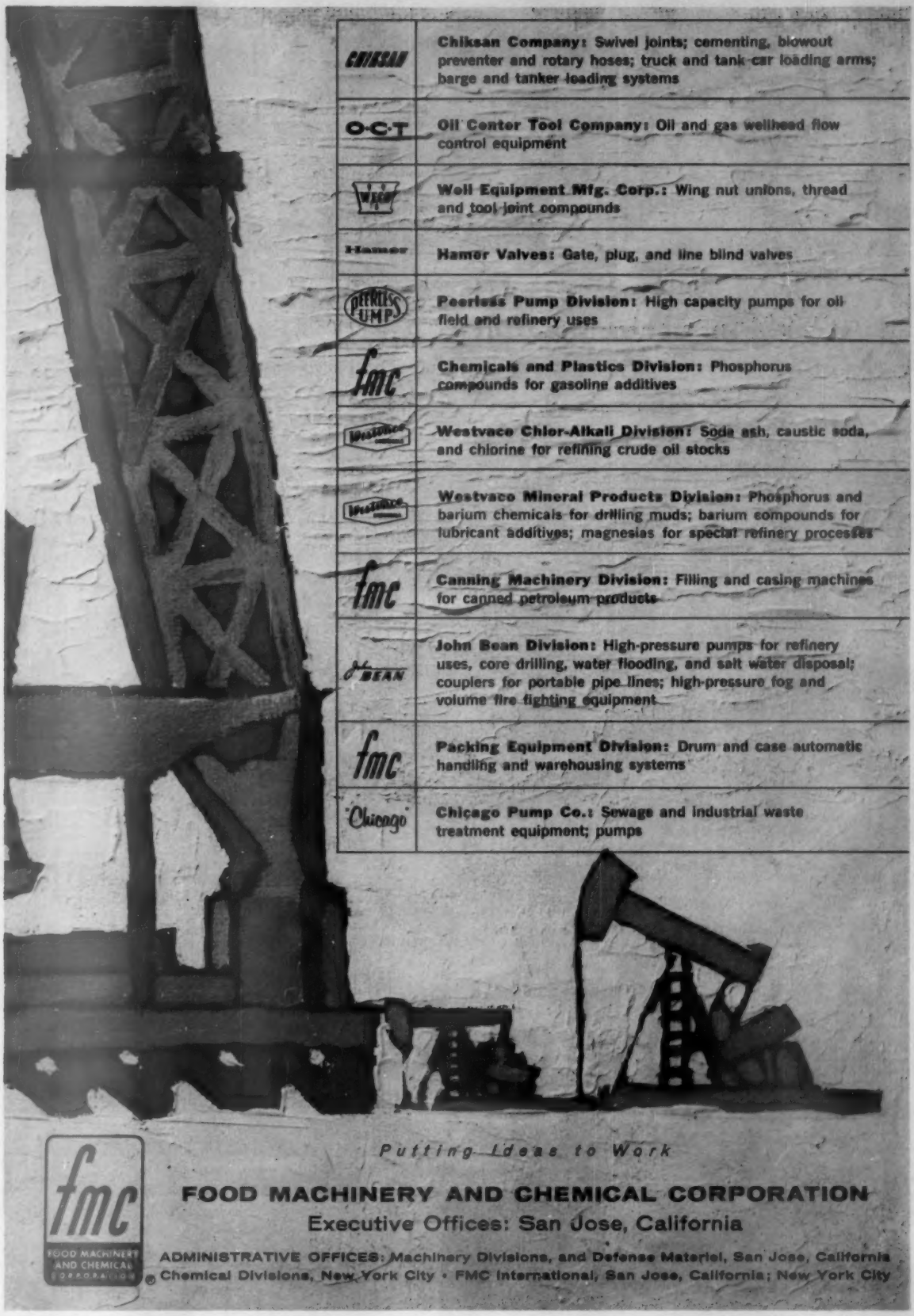
HOW FMC SERVES THE PETROLEUM INDUSTRY

FMC's broad range of manufacturing operations includes an impressive number that in some way serve nearly every phase of the petroleum industry. As outlined in further detail on the page opposite, twelve FMC operations supply specialty equipment or chemicals used in exploration, drilling, refining, transportation, and marketing.

Our company's active interest and participation in producing equipment and chemicals for petroleum is the result of a dynamic policy of product diversification and operational decentralization. This permits each FMC division to direct its specialized abilities to the specific needs of its customers. In petroleum, as in other industries, our customers benefit from the individual attention given their particular product requirements, as well as from the broad creative activities of our extensive central research and engineering laboratories.

This concept of specialization, coupled with broad use of our over-all creative resources and experience, has enabled FMC to achieve a leading position in three major areas: **Basic Chemicals, Industrial and Agricultural Machinery, and Military Defense Materiel.**

For complete listing of our products and services contact FMC, Dept. PRA, Box 760, San Jose, California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Chiksan Company: Swivel joints; cementing, blowout preventer and rotary hoses; truck and tank-car loading arms; barge and tanker loading systems
O-C-T
Oil Center Tool Company: Oil and gas wellhead flow control equipment
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Weil Equipment Mfg. Corp.: Wing nut unions, thread and tool joint compounds
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Fast help on corrosion control
– A big Texas natural gas plant required periodic analyses to determine whether MEA solution was breaking down in regeneration, forming corrosive salts. Samples were being sent out of state for analysis, "took forever" to get results. Enter Allied. Now tests are run in Dallas, results come back *fast*, help this plant prevent corrosion before it can start.

New plant start-up trouble quickly traced – Slug of distillate filled inlet scrubber, carried over to amine system. Aqueous amine solution thoroughly contaminated with hydrocarbon. Customer shut down plant, was going to dump entire charge. Allied specialists diagnosed trouble as too rich amine concentration, then suggested decanting solution into empty tanks, which saved half of charge.

Foaming in glycol plant – Customer wanted to know what caused it, how to stop it. Allied specialists flew to the site, deduced cause of the trouble in a matter of hours. Lab analysis confirmed their findings. In a recommendation just five typewritten lines long, they told customer how to solve the problem completely, economically.

USE GLYCOLS OR AMINES?

ALLIED technical service is ready–right now–to help you find straight answers to knotty problems

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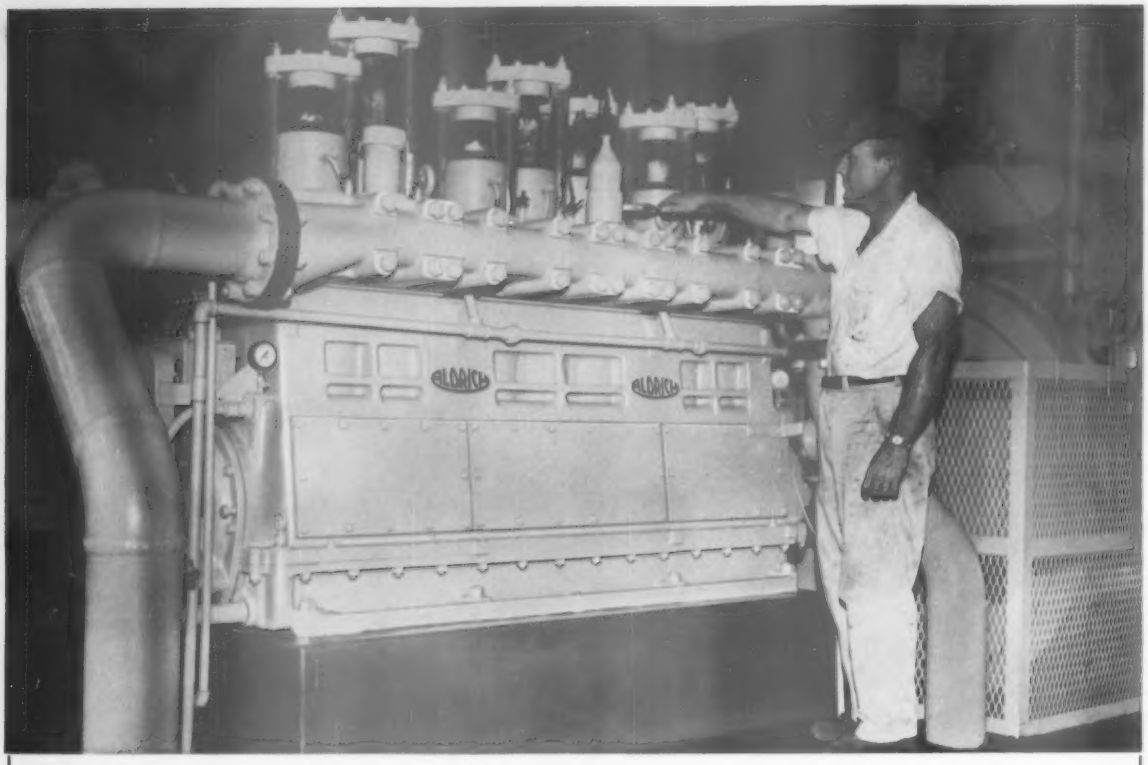


FIELD REPORT

FLOOD: Pegasus Unit

OPERATOR: Mobil Oil Company

PUMPS: Two Aldrich Septuplex

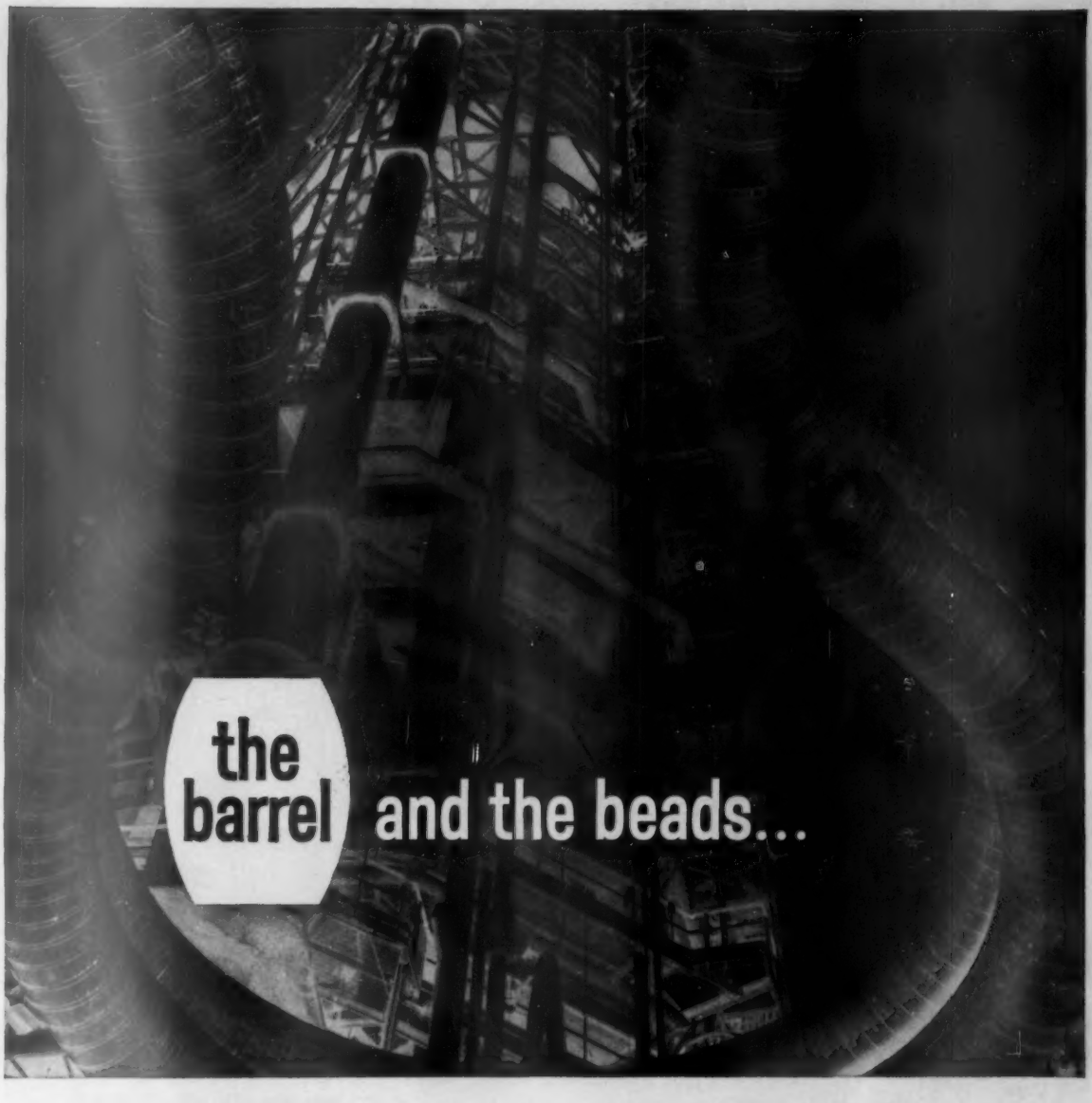
FLOODING STARTED: February, 1955

EXPERIENCE TO DATE:

Pumps continuously deliver brine to two formations — 90 gpm at 2,500 psi; 150 gpm at 1,000 psi. Customer reports: "Routine maintenance only. Aldrich pumps were selected because of previous dependable and economical service under high pressure operations."

Field parts stock available in Carmi, Ill.; Calgary; Casper, Wyoming; Charleston, W. Va.; Houston; Los Angeles; Odessa and Tulsa. For further information, write the ALDRICH PUMP COMPANY, 9 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH



How to get more yield from a barrel of crude for less cost—the new bead catalyst that makes it possible—what it means to the petroleum industry

Petroleum refiners around the world have always had one common economic objective—to get more yield from every barrel of crude oil at lower cost.

Socony Mobil's contributions toward this goal have been outstanding. From the development of the first Thermofor Catalytic Cracking unit and its successor, the Airlift TCC, to the introduction of Durabead, the most efficient, cost-cutting bead catalyst today, Mobil Catalyst Research has led the way in pushing yield levels ever higher, yield costs ever lower.

Now Mobil takes the lead again with Heavy Durabead, a new bead catalyst with all the features of Durabead, plus important new advantages. Heavy Durabead can cut TCC unit construction costs as much as 20%. Used in present TCC units, it can increase reactor and regenerator capacities up to 50%, compared to chrome bead catalyst.

* * *

These are the results of Mobil Catalyst leadership—*greater yields of salable products from every crude oil barrel, increased profits for TCC licensees and operators of other moving bed units in the petroleum industry.*

Socony Mobil Oil Company

Leader in catalyst research

Mobil

To refiners who need more

HYDROGEN
FOR HYDROTREATING

Any refiner who needs more hydrogen can now arrange to make up the deficiency with generating facilities of his own.

Procon is prepared to design, engineer and build a hydrogen plant to suit your needs. Two types of packaged hydrogen plants, capable of utilizing a broad range of hydrocarbons as feed stocks, can be supplied. Catalytic Steam Reforming of light hydrocarbons forms the basis for one type. The other employs Partial Oxidation of heavy fuel oils. With either type, the plant will be designed to produce hydrogen of the purity needed for hydrotreating—and to provide maximum thermal efficiency.

Procon engineers will be glad to consult with you.

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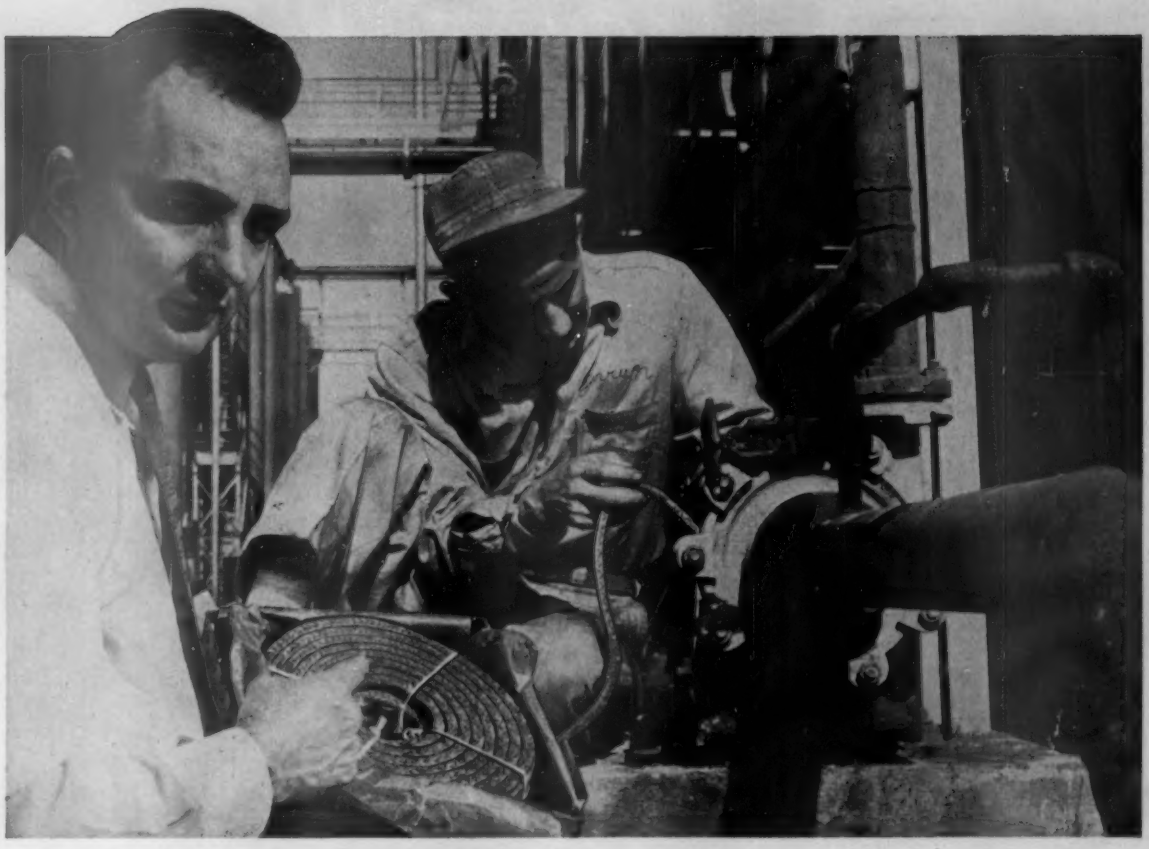
PROCESSES AVAILABLE TO SUIT ANY REFINERY FEED STOCK

*Service includes process design, engineering and construction

WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL AND CHEMICAL INDUSTRIES

SOLVENT PACKINGS



"We tested one packing after another... but only 'U.S.' could stand up,"

Says CHEMICAL PLANT SUPERINTENDENT

When a leading mid-western chemical company put their new plant into operation in 1955, they faced a problem with pump packings: To find a packing resistant to a combination of solvents, caustic and high temperature—with a minimum of shaft wear.

"We tested one packing after another on our caustic pumps," says the plant superintendent, "and found that U. S. Solvent Packing outlasted any other packing tested *by as much as 10 to 1.*"

Result: No more morale-breaking "clean-up" sessions, production is increased, personal injuries due to leaks have been reduced 75%, and there's no need for rescheduling due to breakdowns.

A "U. S." technician, of course, worked with engineers of the chemical company to develop the right packing for this particular requirement. That's part of the "U. S." service, when needed.

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

Mechanical Goods Division

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WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

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ONE OF THESE MISSION VALVES AND SEATS WILL GIVE YOU THE MOST FOR YOUR MONEY

Because Mission Valves and Seats are designed to give you the most for your particular service. For *extremely high pressures*, the Mud Monarch® with an effective seal ring even when body and seats are severely worn. Compound 308® and Compound 711 inserts are available. For *medium pump pressures*, the Mission Super Service, with four cross arms for extra strength. And for *low and medium pressures*, the Silver Top with replaceable, wear-taking bushing which greatly reduces valve seat replacement. Compound 308 inserts are interchangeable with Super Service valves. Longer life is built in to all Mission valves and seats to give the most with all popular makes of reciprocating pumps. At supply stores everywhere.

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They Say—

Not big enough for job

"For every dollar from depletion plowed back into the finding of new reserves, the producing industry has in recent years put up and spent another $2 from other sources.

"Yet the original rate of 27½% was designed to cover the cost of finding a new barrel of oil. It simply is not, therefore, doing the job."

Leigh W. Clark, assistant secretary-treasurer, Standard Oil Co. of Texas, in a speech to the New Mexico Oil and Gas Association.

They're not regulation

Dear Sir:

In your issue of October 19 ("They Say," p. 62) Donald Morgan, a consulting petroleum geologist, takes the oil industry to task because he has observed service stations that deal in used cars.

I am confident that if Mr. Morgan were to query marketing executives of the respective supplying companies, he would find them even more disturbed over this practice than he is.

If Mr. Morgan were to investigate further, he would find that the service stations dealing in used automobiles are operated by independent businessmen, not by the oil companies. The oil companies are prohibited by law from dictating to these independent dealers how they should run their businesses.

An oil company can't tell a dealer, even though he may be selling gasoline under that company's brand name, that he must not sell used automobiles at his station, even though he may also lease the station from the company.

The service station zoning policy of API's Marketing Division defines a service station as "a retail place of business engaged in supplying goods and services essential to the normal operation of automobiles. These do not include body or fender work, painting or major motor repairs." The sale of used cars would not fall within this definition.

"Many of these stations," Mr. Morgan says, "are newly built in residential areas." Our service station zoning policy requests that service stations be permitted only in those areas which allow other retail business.

It cannot be denied that there are

High in the Rocky Mountains, oil and gas producers are turning more and more to Dowell for acid-base fracturing services. Both limestone and dolomitic formations of this area respond well to Acid Petrofrac.

MAKE YOUR WELLS WORTH MORE

Improve Production Potential With Acid-Base Fracturing By Dowell

Most formations—even many sandstones—contain important amounts of acid-soluble calcareous materials. Often, the results of fracturing such formations are improved when an acid-base frac fluid is used.

The reasons for these improved results vary with formation characteristics and the particular fluid used. In general, however, it is believed that fractures are deepened and enlarged. Furthermore, the porosity and permeability of the formation next to the fractures is increased, so well fluids can flow more readily into the fractures.

In many cases, the result is a reduction in the pressure loss between the formation and the well bore, as indicated by an improved productivity index. Often, after fracturing with one of Dowell's acid base fluids, a well that had been on pump will flow for a considerable time.

Dowell can tailor acid-base fracturing fluids to the requirements of nearly any well and treating procedure. Fluids can range from water-thin to extremely viscous. Sand-falling rate can be controlled over wide limits. Acid concentrations can range from less than one per cent to above 20 per cent. Any of several Dowell Fluid Loss Additives (F.L.A.*) may be used depending on the nature of the fluid and other requirements.

Reaction time of the acid can also be varied within wide limits. Most Dowell acid-frac fluids have a retarded action, but some are actually "intensified" to speed reaction.

On the opposite page you will find some of the problems frequently encountered for which Dowell provides proved solutions.

In addition to a complete set of fracturing services, Dowell offers you full research facilities and equipment second to none in the oil fields. These are good reasons why it makes sense to call Dowell for your next fracturing treatment.

For prompt service, or detailed information call your nearest Dowell representative. Dowell has more than 165 offices and stations in the United States, Canada, Venezuela and Argentina. Or write Dowell, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Here Are Some Profitable Ways To Use Acid-Base Fracturing By Dowell

If you need a low-cost acid-fracture treatment:
DUOFRAC*, a Dowell fracturing service that uses dilute acid (1 to 7½ per cent), is designed to help you. Low fluid costs and the ability to dissolve salt are outstanding features. Salt and limestone dissolving properties may be altered by changing the acid concentration. Fluid loss can be controlled within wide limits with F.L.A. Emulsion and silicate swelling problems can be controlled with Dowell addition agents especially developed for the purpose. For low-cost fracturing of even slightly soluble formations, Duofrac may give a quick payout that would be hard to obtain with other treatments. It has given excellent results in formations like the Clearfork of West Texas.

If you want to fracture dense dolomite:
ACID PETROFRAC* with *intensifying* agents has given good results. It uses an acid-oil emulsion that has excellent sand-carrying qualities. It gives a deep-penetrating retarded acid action, yet the intensifying agents aid complete spending with normally slow-acting dolomite. The combined acidizing-fracturing action helps provide both a large drainage area (from fracturing) and permeability improvement (from acidizing). This frequently gives the operator a better well than he could get with either fracturing or acidizing alone.

If you want to fracture a high-temperature well:
STRATAFRAC* may be indicated. This service uses an acid-kerosene emulsion that maintains its stability and sand-carrying qualities even if well temperatures are above 250° F. This high-temperature sand-carrying capacity accounts for the widespread use of Stratafrac to fracture the deep, high-temperature, low-solubility Wilcox sands along the Gulf Coast.

If you have a highly soluble pay:
FRAC ACID* is helping operators to extra profits. This Dowell-developed service uses a specially thickened acid solution as the sand carrying medium. It is designed to give the full benefits of acidizing plus the sand-propping benefits of fracturing. Treatments may be preceded and/or followed with other Dowell acids. Formations like the Mississippi lime in the Texas Panhandle have shown excellent production increases with Frac Acid.

If you want the best possible help:
Call the nearest Dowell engineer to help you plan the treatment for your well. He can draw from Dowell's vast background of experience to help you choose between Dowell's wide variety of acid-base, water-base and oil-base fracturing fluids. His knowledge of local conditions can be important aids in your planning.

*Dowell Trademark

"FRAC GUIDE*" Now in use *exclusively* by Dowell engineers, this revolutionary new system has increased the success ratio of fracturing treatments by more than 50%. Ask your Dowell representative to *engineer* your next treatment using the "Frac Guide." This extra service costs you nothing.

The Oil and Gas Journal assembly line, Tulsa, Okla.

"Putting Together" The Journal Every Week Is a Big Operation

The machine you see is The Oil and Gas Journal's high-speed binding and gathering machine. It takes over where the printing presses and folders leave off—gathering the pages, binding, gluing, and stitching together the Big Yellow Book at the rate of *70 copies per minute*.

This is literally where the more than 43,000 paid Journal subscriptions are "put together" each week before they hit the mail chute. This is just one facet of the assembly-line methods which help *speed the Journal to you* and other subscribers in 94 countries.

But it takes more than machines to turn out a weekly news and technical publication as wide-ranging as the Journal. It takes scores of efficient production workers and editors with plenty of know-how.

The 45 full-time editors and editorial assistants are specialists in their fields, and so are the dozens of news correspondents and technical authors who write for the Journal. These are the people who actually "put together" the Journal week in and week out. They uncover and analyze news events and technological developments as they happen, and then sift the chaff from the grain.

It's this combination of speedy production methods and editorial talent that helps make the Journal the timeliest yet the most thorough magazine in the oil and gas industry.

Read it.

It's reliable!

The OIL AND GAS JOURNAL

Box 1260, Tulsa, Okla.

some service stations that fall short of the industry's concept of a modern station. In a free economy, this is inevitable. But I think we can all agree that today's typical new station represents a great advance over the "filling stations" of several years ago. Plans now on the drawing boards or under trial by many marketers give promise of even more attractive stations.

A. J. Rumoshosky, Director
Division of Marketing
American Petroleum Institute

Sinclair in Alaska

"We in Sinclair are well aware that Alaska presents some formidable new operating problems. We refer to the problems of weather, rough terrain, lack of supply sources, and so forth.

"As a result, operating costs may be from four to 10 times those in the rest of the United States. I have said that costs of finding and producing oil in Alaska will be vastly higher than in the states south of us.

"But I didn't stress 'costs per what.' I mean costs per day, not costs per barrel.

"It is clear already that while it may cost a great deal more in Alaska than in any other state of the Union to find oil and start it to market, it may turn out that if the money is wisely and efficiently spent, it may produce more barrels of oil per dollar of outlay than in any other state.

"That seems to have been demonstrated by the U. S. Navy on the arctic slope. It spent about $60 million in that remote and frozen region. But for that money it found more than 60 million barrels of oil reserves, and several billion cubic feet of gas. That is an achievement we cannot always duplicate to the south of here."

William H. Morris, president, Sinclair Oil & Gas Co., in a speech to the Anchorage Chamber of Commerce.

Personnel problem

"Foreign manufacture can be an extremely complex problem involving, in some cases, entirely new management policies to meet the local situation.

"However, I do not suggest, in fact, I oppose the idea that it means a change in fundamental principles of private initiative and individual incentives. We must be steadfast in maintaining broad principles. The basic purpose of any business enterprise is to earn a profit. But the only way this purpose can be successfully achieved, over the long term, is to keep the business operating in con-

SEASON'S GREETINGS

From the Oil Bank of America to oil men around the world. Season's Greetings from all of us at NBT . . . and our sincerest wishes for your progress and prosperity throughout the year ahead. National Bank of Tulsa

NATIONAL BANK OF TULSA

NBT

welcomes 1960 as another opportunity for even broader service — as an expression of our faith in the oil industry and in the men who've made OIL a great industry.

NATIONAL BANK OF TULSA, *tulsa, oklahoma*

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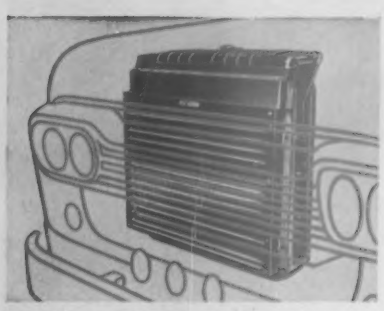


CLOSER TEMPERATURE CONTROL obtained with automatic radiator shutters means longer engine life, more efficient operation. Temperature variation between 167° and 187° with shutters as compared to 102° to 181° without shutters was reported and certified in loaded vehicle road tests.

LONGER WIRING HARNESS LIFE is the direct result of Ford's greatly improved electrical wiring system for 1960. Ford's '60 wiring harness and the 1959 wiring harness were subjected to shaker table tests plus constant exposure to oil and water vapors, and temperatures of 200°. Certified test results show a threefold increase in 1960 wiring harness life.

INCREASED FUEL PUMP RELIABILITY is an added benefit from Ford's submerged-type electric fuel pump. Certified results of dynamometer tests showed no vapor lock with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical fuel pump resulted in a power loss of 9% under same conditions.

It's a fact! Numerous reports from high-mileage operators of Super Duty Trucks attest to Ford's outstanding durability. Studies by an independent research firm provide certified proof that these models are even more durable for 1960.

Ford Super Duty Trucks have earned a reputation for exceptional performance and durability since their introduction two years ago. Shop service records of many leading fleets show Super Duty tractors with mileage readings between 150,000 and 250,000 and no repairs other than normal maintenance. Similar testimony to the dependability of these Big V's by other satisfied users is being added each month. Is it any wonder that '59 sales of these units were more than double those of 1958?

And for 1960, the Ford Super Duties offer additional refinements. Bigger optional axles and increased GVW's to permit greater payloads and more profitable operation. Automatic radiator shutters to keep the engine temperatures within the most efficient operating range, improved submerged-type electric fuel pumps to prevent vapor lock, and redesigned wiring for more reliable operation are typical of the improvements to be found in these units.

The changes offered for 1960 were tested and evaluated by a leading research organization. Certified results of the studies by this impartial firm (name available on request) provide proof that Ford's Super Duty Trucks are even more dependable.

- **Certified Durability through closer temperature control!** Independent research engineers certify that Ford's thermostatically controlled radiator shutters kept water temperature between 167° and 187° in severe mountain grade operation. The test truck with shutters blocked open under same operating conditions had a temperature range from 102° to 181°. The temperature variation of only 20° with shutters means less expansion and contraction in block and heads. Higher, more constant temperatures permit oil to circulate more freely, reducing internal friction. All these factors contribute to longer engine life.
- **Certified Reliability with longer-lived electrical system!** Thicker insulation on wires resists deterioration by heat, oil and gasoline. Asphalt-impregnated loom and plastic-coated mounting clips protect against abrasion. Certified results prove that the 1960 wiring harness has three times longer life.
- **Certified Reliability with Ford's submerged-type electric fuel pump!** Dynamometer tests of engines with submerged-type electric fuel pump and conventional mechanical type showed that vapor lock was non-existent with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical pump resulted in a power loss of 9% at an underhood temperature of 200°.

Endurance tests were run on alternators, two-speed axle speedometer adapters and other related components with similar results. Get all the facts at your Ford Dealer's now!

in Ford Super Duties!

"Our first Ford C-1000 tractor has logged 190,000 trouble-free miles since March of '58,"

says Robey W. Estes, Vice President and General Manager of Estes Express Lines, Richmond, Va. "We haven't had a single road failure and we only bring it into the shop for regular preventive maintenance work once a month.

"We use the 477 engine and find oil consumption is exceedingly low . . . only one or two quarts added between 3000-mile oil changes. Engine compression at 190,000 miles is still high and fairly equal and our drivers say that power and pep are at about the same level as when the truck had been run only 60,000 miles.

"We are grossing between 52 and 56,800 pounds with our Ford Tilts. They are giving about the same gas economy and better oil mileage than other makes in our fleet. We bought our fourth Ford C-1000 tractor last month and hope to add more soon."

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . BUILT TO LAST LONGER, TOO!

formity with the public welfare of the host country.

"American private investment in capital facilities overseas carries with it exceedingly important public responsibilities . . . it may well be a key to our future relations with other nations in the world.

"The requirements for success in foreign operations undoubtedly vary in detail from industry to industry and from country to country. However, it seems to me there is one factor common to all which is the foundation of success at home or abroad, and that is the choice of people.

Those of us who go abroad are the ones who will establish the character of the corporation, integrate the company with the economy in which it operates, and make it responsive to the community, to the laws, and to the market.

"It has always seemed to me difficult enough to find the right man for a given position in a going business in the United States, but to make such a selection for a post thousands of miles away compounds the problem many fold."

W. Sam Carpenter III, general manager, international department, Du Pont Co., in a speech to the National Foreign Trade Convention, New York City.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

DECEMBER

6-9 American Institute of Chemical Engineers, annual meeting, Sheraton Palace Hotel, San Francisco.

10-11 Mid-Continent Oil and Gas Association, annual ad valorem tax forum, Baker Hotel, Dallas.

11-15 Society of Automotive Engineers, meeting, Sheraton-Cadillac and Statler hotels, Detroit.

JANUARY

11-15 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac Hotel, Detroit.

15-16 Association of Oilwell Servicing Contractors, annual meeting, Baker Hotel, Dallas.

17-19 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

18-20 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-4 Instrument Society of America, instrument-automation conference and exhibit, Rice Hotel and Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

7-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

24-25 Wisconsin Petroleum Association, annual convention and exhibit, Schroeder Hotel, Milwaukee.

24-26 National Association of Corrosion Engineers, Tulsa section, eleventh annual corrosion short course, Mayo Hotel, Tulsa.

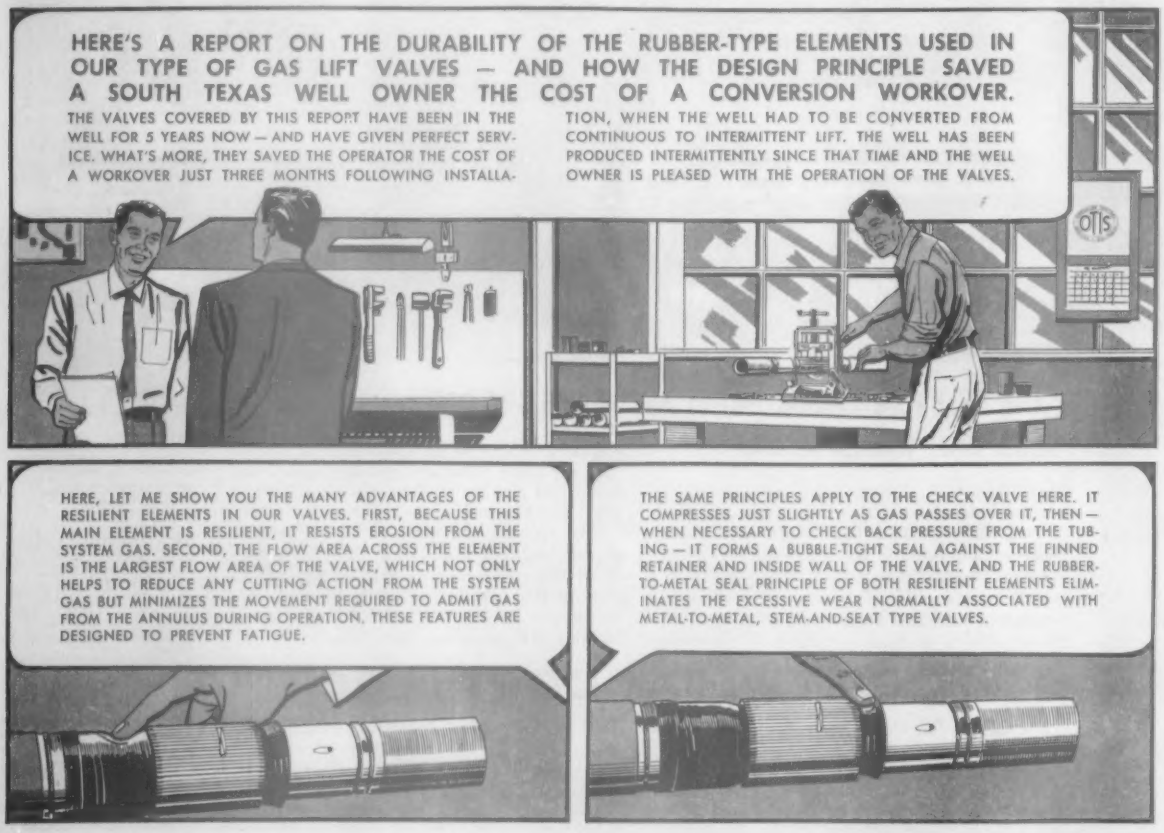
26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel Dallas.

7 Canadian Petroleum Association, an-


HERE'S A REPORT ON THE DURABILITY OF THE RUBBER-TYPE ELEMENTS USED IN OUR TYPE OF GAS LIFT VALVES — AND HOW THE DESIGN PRINCIPLE SAVED A SOUTH TEXAS WELL OWNER THE COST OF A CONVERSION WORKOVER.
THE VALVES COVERED BY THIS REPORT HAVE BEEN IN THE WELL FOR 5 YEARS NOW — AND HAVE GIVEN PERFECT SERVICE. WHAT'S MORE, THEY SAVED THE OPERATOR THE COST OF A WORKOVER JUST THREE MONTHS FOLLOWING INSTALLATION, WHEN THE WELL HAD TO BE CONVERTED FROM CONTINUOUS TO INTERMITTENT LIFT. THE WELL HAS BEEN PRODUCED INTERMITTENTLY SINCE THAT TIME AND THE WELL OWNER IS PLEASED WITH THE OPERATION OF THE VALVES.
OTIS
HERE, LET ME SHOW YOU THE MANY ADVANTAGES OF THE RESILIENT ELEMENTS IN OUR VALVES. FIRST, BECAUSE THIS MAIN ELEMENT IS RESILIENT, IT RESISTS EROSION FROM THE SYSTEM GAS. SECOND, THE FLOW AREA ACROSS THE ELEMENT IS THE LARGEST FLOW AREA OF THE VALVE, WHICH NOT ONLY HELPS TO REDUCE ANY CUTTING ACTION FROM THE SYSTEM GAS BUT MINIMIZES THE MOVEMENT REQUIRED TO ADMIT GAS FROM THE ANNULUS DURING OPERATION. THESE FEATURES ARE DESIGNED TO PREVENT FATIGUE.
THE SAME PRINCIPLES APPLY TO THE CHECK VALVE HERE. IT COMPRESSES JUST SLIGHTLY AS GAS PASSES OVER IT, THEN — WHEN NECESSARY TO CHECK BACK PRESSURE FROM THE TUBING — IT FORMS A BUBBLE-TIGHT SEAL AGAINST THE FINNED RETAINER AND INSIDE WALL OF THE VALVE. AND THE RUBBER-TO-METAL SEAL PRINCIPLE OF BOTH RESILIENT ELEMENTS ELIMINATES THE EXCESSIVE WEAR NORMALLY ASSOCIATED WITH METAL-TO-METAL, STEM-AND-SEAT TYPE VALVES.

nual general meeting, Hotel Palliser, Calgary.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16 Petroleum Equipment Suppliers Association, eastern district membership meeting, Duquesne Club, Pittsburgh.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

22 Petroleum Equipment Suppliers Association, Gulf Coast district membership meeting, Shamrock Hilton Hotel, Houston.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

29-31 American Power Conference, annual meeting, Sherman Hotel, Chicago.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5 Petroleum Equipment Suppliers Association, southern mid-continent district membership meeting, Statler Hilton Hotel, Dallas.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

12-14 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, conference and exhibition, Municipal Auditorium, Kansas City.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

21-22 Texas Technological College, seventh annual West Texas oil lifting short course, Lubbock, Tex.

21-23 Society of Economic Paleontologists and Mineralogists, Permian basin section annual meeting and field trip, Abilene, Tex.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

25-27 Southern Gas Association, convention, Buccaneer and Galvez hotels, Galveston.

25-28 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

25-29 American Welding Society, annual meeting and welding exposition, Los Angeles.

26 Petroleum Equipment Suppliers Association, Pacific district annual membership meeting, Ambassador Hotel, Los Angeles.

27-29 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

28-29 American Petroleum Institute, Division of Transportation, pipeline conference, Mayo Hotel, Tulsa.

28-29 Pacific Coast Gas Association, distribution conference, Benson Hotel, Portland.

MAY

1-4 American Petroleum Institute, Division of Transportation, tanker conference, Seaview Country Club, Absecon, N. J.

2-3 Society of Petroleum Engineers of AIME, North Texas section, fourth biennial secondary recovery symposium, Wichita Falls, Tex.

5-6 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual joint meeting of Rocky Mountain petroleum sections, Calgary.

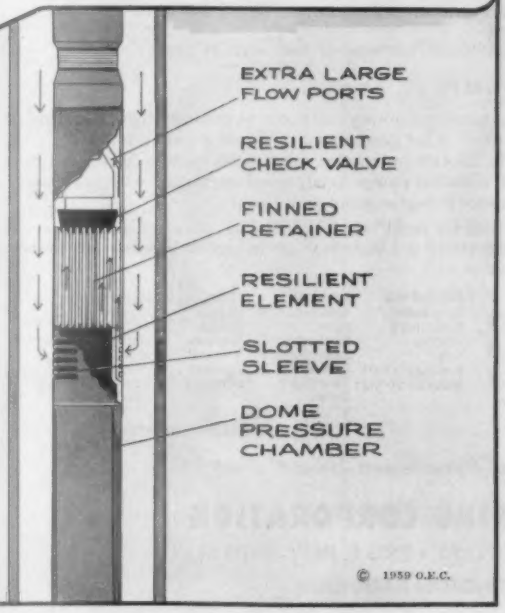
5-6 Canadian Institute of Mining and Metallurgy, annual technical meeting of petroleum and natural gas division, Palliser Hotel, Calgary.

9-11 Instrument Society of America, power instrumentation symposium, San Francisco.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Statler and Sheraton-Cadillac hotels, Detroit.

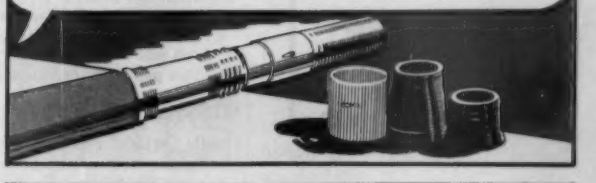
9-13 American Gas Association, distribution and transmission meeting, Jung and Roosevelt hotels, New Orleans.

I'LL SHOW YOU HOW WE BOND THE MAIN VALVE ELEMENT TO THE VALVE MANDREL ASSEMBLY IN A MINUTE — BUT FIRST LET ME SHOW YOU THIS FLOW DIAGRAM OF OUR TYPE C GAS LIFT VALVE. PRESSURE FROM THE VALVE DOME HOLDS THE MAIN VALVE ELEMENT CLOSED ACROSS THE SLOTTED PORTS. WHEN GAS PRESSURE IN THE ANNULUS EXCEEDS THE SET PRESSURE OF THE VALVE, THE MAIN VALVE ELEMENT OPENS. WHEN THE PRESSURE FROM THE ANNULUS DROPS BELOW THE SET PRESSURE OF THE VALVE, THE VALVE CLOSES.



© 1959 O.E.C.

NOW HERE'S HOW WE BOND THE MAIN VALVE ELEMENT TO THE VALVE MANDREL ASSEMBLY. FIRST WE SERRATE THE SEALING SURFACES OF THE MANDREL ASSEMBLY TO GIVE IT A SUPERIOR BONDING SURFACE. THEN WE APPLY A SPECIAL BONDING CEMENT, SLIP THE RUBBER ELEMENT INTO PLACE, AND BAKE THE COMPLETE ASSEMBLY FOR ONE HOUR AT 375° F. THIS PRODUCES A PRESSURE-TIGHT SEAL AT THE ELEMENT END OF THE DOME CHAMBER. AS A RESULT, OUR VALVES CAN BE EXPECTED TO MAINTAIN THEIR SET PRESSURE INDEFINITELY.



IF YOU'RE PLANNING A NEW GAS LIFT INSTALLATION AND WANT TO RUN VALVES THAT WILL STAY IN THE HOLE AND GIVE YOU TROUBLE-FREE SERVICE — INSTALL OTIS GAS LIFT VALVES. THEY HAVE NO METAL MOVING PARTS . . . NO BELLOWS TO FATIGUE . . . NO METAL SEATS TO CUT OUT . . . AND THEY'RE DESIGNED TO OPERATE CONTINUOUSLY OR INTERMITTENTLY WITHOUT HAVING TO BE PULLED FOR CONVERSION. CONTACT ONE OF OUR GAS LIFT SPECIALISTS AT THE OTIS OFFICE NEAREST YOU. HE'LL BE GLAD TO SHOW YOU THESE AND OTHER EXCLUSIVE FEATURES AND EXPLAIN HOW OTIS GAS LIFT VALVES ARE DESIGNED TO SAVE YOU MONEY.

Otis - "First in Gas Lift Control"

OTIS

OTIS ENGINEERING CORPORATION

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Branches Throughout the Oil Country

This flow-control valve—the key to SARGENT hydraulic pumping systems, the most efficient yet developed—is your key to production profit.

PROFIT = PRODUCTION – (Installation & Maintenance)

When SARGENT took the long stroke unit from the TOP of the hole and placed it at the BOTTOM to operate the time-proved standard bottom-hole pump, things happened!

WITH THE SARGENT FREE TYPE PUMP:

1. Sucker rods are eliminated, along with the cost of rod replacement and tubing wear.
2. Maintenance costs drop. No longer a need for costly crew time or expensive pulling equipment.
3. Maximum effective long, bottom-hole stroke is made possible by the exclusive SARGENT design which provides positive plunger travel with pre-set valve spacing.
4. Unrestricted application because the pump can be used on any well or on more than one well in group operations.
5. This pump has been operated on oil, salt water or fresh water as power fluid.

UNDER THE TOUGHEST FIELD CONDITIONS

"MISSILE QUALITY" PUMPS

"Missile Quality" represents the uncompromising excellence of product engineering and manufacture where "almost perfect" is not good enough. Years of experience in the design and production of missile, aircraft and marine components enables SARGENT to produce "missile quality" A.P.I. classified pumps in advanced metals and designs to meet any well condition – your assurance of better pump performance.

If you are interested in "production for profit" use SARGENT.
Talk to your SARGENT Representative and learn how profits can be boosted by lowered "Installation-Maintenance" costs.

SALES AND SERVICE

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*Sales Representation

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.– U. S. Supreme Court

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ENGINEERING CORPORATION

MAIN OFFICE & PLANT • 2533 E. FIFTY-SIXTH ST.
HUNTINGTON PARK, CALIF.

50 years ago

December 6, 1909

Gas companies express fear Kansas gas fields are near exhaustion and that they will have to turn to Oklahoma for their supplies. Failure of Kansas fields due to shallow wells and thin sands, they say.

Coalinga becomes California's top oil-producing field. Daily output climbs above 43,500 bbl. Kern River field is second with daily yield of 41,000 bbl. The two fields produce more than one-half of state's total of 163,500 bbl. daily.

Long-drawn-out controversy over naming of Oklahoma's rapidly developing field in Okmulgee County ends. Four months old, but now famous pool to be called Preston for Alex Preston, "daddy" of the field, and the new boom town of Preston. Name of Hamilton Switch dropped.

25 years ago

December 6, 1934

Governors and other representatives of oil-producing states assemble at Ponca City, Okla., at invitation and as guests of Oklahoma Gov. E. W. Marland to "discuss matters of great concern as they affect the petroleum industry of these states". Strong opposition to federal control of oil production expressed. Possible formation of an interstate oil compact on the agenda.

Playa Del Rey, on the palisades of Los Angeles County, becomes California "hot spot" following completion of outpost 5,000-bbl. oil well. Seven new tests already under way with 15 to 20 others expected within few weeks. Union Oil Co. appears to control cream of acreage although Ohio Oil Co. discovered field.

10 years ago

December 8, 1949

Five independent southwestern producing companies merge into newly formed Texas Consolidated Oils, Inc. Included are Texmass Petroleum Co., Petroleum Reserves Corp., and Swiss Oil Co., all of Dallas; Midway Oils, Inc., Topeka; and National Cooperative Refinery Association, Wichita. Combined properties valued at $40,000,000.

Second oil field indicated for Florida as Coastal Petroleum Co.'s State-Grossman wildcat in Dade County gets good showing below 10,775 ft. in Glen Rose-Sunniland formation, producing horizon of state's only field, at Sunniland, in Collier County.

First commercial installation of Loran stations completed on Gulf Coast. New operation by Seismograph Service Corp. to aid offshore surveying and position locating in geophysical work.

JOURNALLY SPEAKING

Quiz Happy

"TEST YOURSELF. See what kind of an employe you really are," said the heading on this quiz in a magazine that crossed our desk the other day.

Somebody farther up the routing slip had already tested himself, with the result shown below.

Very funny. But did he display a good sense of humor—or unusual frankness?

How would you answer this quiz? How could you answer it honestly and objectively? Wouldn't you give yourself the benefit of the doubt and come out with top rating on everything? What's the point of this sort of thing, anyway?

The more we read the questions, the sillier the whole thing seemed. We concluded that our anonymous colleague had put the thing in its proper light.

This looks to us to be the ridiculous extreme of today's vogue—or fad—for psychological tests and self-analysis of all sorts. Such things have their uses—and also their abuses. It could be that industry is putting too much faith in such gimmicks as an aid in hiring and promoting employes.

We have heard it said that no psychologist has been able to devise a test that some smart cookie couldn't beat. Books can be bought on newsstands that tell you how to come out with a top rating on any kind of test an employer can give you.

Right now there's a big to-do over education, and the pendulum seems to be swinging away from the so-called "progressive" methods back toward the old-fashioned hickory-stick type of pedagogy where the teacher depended more on horse sense than on peg boards and percentile curves.

We have a hunch that employe relations are going through a similar cycle and will likewise take a swing back.

A boss has no business being a boss unless he can tell who gets the work done without consulting a psychologist or running punch cards through an electronic calculator.

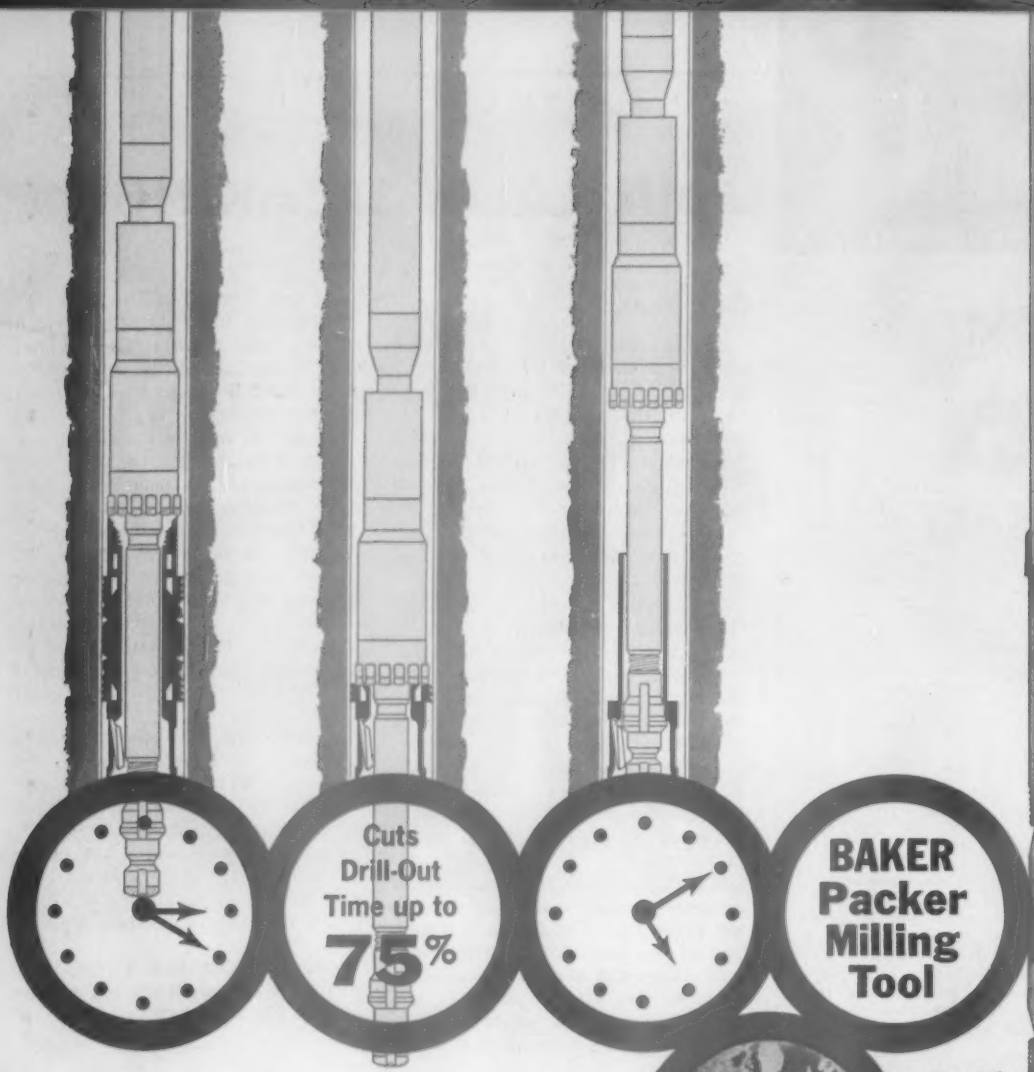
Science is just dandy, but people are still human beings and we hope they can remain so in spite of all the robots that help do certain types of jobs.

And, no matter how it's filled out, what good is a do-it-yourself psychoanalysis like this one?

—Henry D. Ralph.

Frank Confession (?)

	Always	Usually	Sometimes	Never
1. Do you report to work on time regularly?	☐	☐	☐	☒
2. Do you follow all job rules and regulations?	☐	☐	☐	☒
3. Do you keep your personal appearance neat?	☐	☐	☐	☒
4. Do you avoid day dreaming and clock watching?	☐	☐	☐	☒
5. Are you considered friendly and congenial?	☐	☐	☐	☒
6. Do you like to work with others in a team effort?	☐	☐	☐	☒
7. Are you willing to help fellow employes?	☐	☐	☐	☒
8. Are you enthusiastic about your company?	☐	☐	☐	☒
9. Are you enthusiastic about your job?	☐	☐	☐	☒
10. Is your work neat, accurate, and thorough?	☐	☐	☐	☒
11. Are you eager to learn more about your job?	☐	☐	☐	☒
12. Do you appreciate constructive criticism?	☐	☐	☐	☒
13. Do you stick to a job until finished?	☐	☐	☐	☒
14. Do you keep your surroundings neat?	☐	☐	☐	☒
15. Do you take work problems to your supervisor?	☐	☐	☐	☒
16. Are you eager to make your job more productive?	☐	☐	☐	☒
17. Do you participate in community activities?	☐	☐	☐	☒
18. Do you carry a fair share of the group effort?	☐	☐	☐	☒
19. Do you promote safety on and off the job?	☐	☐	☐	☒
20. Do you feel your job is important to the company?	☒	☐	☐	☐



THAT'S RIGHT... rock bits require 8 to 16 hours to drill-out drillable Production packers—but the new Baker Packer Milling Tool does the job in 2 to 4 hours.

Why does this new tool reduce the time so drastically? Because Baker engineers designed it to perform this one job efficiently. It is not an all-purpose milling tool. Hence, it does not mill up the entire packer, but *only* those elements that hold the packer in a set position against the casing.

Another important factor is the sustaining, self-sharpening action of the milling shoe and bottom sub. These cutting areas are dressed with special Baker Milling-Carbide Compound. Hundreds of carefully selected carbide chips are bonded in a matrix, and so distributed that an efficient milling action is always maintained.

During milling the tool is stabilized in the casing by its lower portion which rotates inside the packer body. A simple spring-loaded *catch sleeve* expands below the packer so that when the tool is retrieved, the remaining portion of the packer can be brought to the surface. This catch sleeve also provides a positive emergency release.

In addition to Baker production packers, the milling tool may be used for other drillable packers of similar design. It is available domestically on a low-cost rental basis, through your experienced Baker Serviceman—ask him for complete information or write for Catalog Supplement No. 353.

Set at 19,425 feet in 7-inch casing, this Retainer Production Packer was milled over in two hours and fifty minutes, and the cast-iron body and bottom of packer retrieved without damage to 4½-inch liner just below it.

PRODUCT NUMBER 747-C

BAKER OIL TOOLS, INC. • HOUSTON • LOS ANGELES • NEW YORK

Today's marketing concepts vitally affect producers

THE PRODUCING BRANCH of the industry has a big stake in the revolution now going on in oil marketing. It should understand the movement and join in it.

For a hundred years producers have operated on a philosophy paraphrasing Emerson's famous remark about a better mousetrap: Find an oil trap and the world will beat a path to your door.

Today producers have to beat their own paths to consumers' doors. At least they have to cooperate with the pathmakers—refiners and marketers—to keep old paths open, to build new ones, and to make both profitable.

THE ONLY MONEY the industry takes in to finance any of its operations comes from marketing. Yet producers seldom give a thought to keeping marketing healthy. Nor, until recently, have the nonmarketing divisions of some integrated companies.

There has long been a feeling, whether true or not, that marketing is the least profitable division of the industry. Therefore it has sometimes been neglected, and it may have become less efficient than production, refining, and transportation.

The revolution in marketing is not just the awareness that markets are no longer waiting but must be built and bargained for. Foreign producers and U.S. integrated companies have been aware of that for some time. It is the realization that marketing must be efficient and profitable and that volume alone does not necessarily assure that result.

Every aspect of distribution and marketing is getting intensive study, and marketing men are rising high in the counsels of the industry. Some big changes in former practices are in the making, moves to cut costs and make a profit on less volume if necessary.

Thus marketing is moving into position to call the tune for the whole industry. Marketing efficiency—its successes and failures—can indirectly but effectively determine where drilling will be done, how much crude will be produced where and at what price, and how refineries will be operated.

RETAIL PRICE WARS are one example of profitless marketing which should deeply concern producers. They should realize their part in this chain reaction:

Production of more crude than refiners really need causes excess refinery output; part of this excess is sold at distress prices outside of normal marketing channels; this puts new competitors into an already overcrowded marketing field, reduces the volume of all the rest, and undermines all price structures, including the crude price.

In many other ways also, producers should keep in step with the new industry thinking generated by the intense marketing competition.

Customer fuels are prepared for road rating in Ethyl's controlled-weather chassis dynamometer room.

Ethyl Research evaluates current premium fuels

Makes Results Available to Industry

One hundred thirty-one motor gasolines—112 premium and 19 super premium fuels—have been thoroughly tested in the laboratory and on the road in Ethyl's latest study of premium fuel performance.

Results of the study—including road performance evaluations for both full throttle and part throttle operation—are available to refiners as an aid to understanding current fuel problems and planning future fuels. In addition, Ethyl Research has expanded and brought up to date its system for calculating road performance from routine laboratory data.

All tests were conducted at Ethyl's Detroit Research Laboratories. Road tests were made in five 1959 cars and three test cars equipped with experimental high compression engines.

Of special interest is the information on part throttle operation since some late model cars are knock-limited at part throttle.

Summary of Ethyl Research Findings

1. Laboratory octane numbers may be used to provide estimates of road antiknock performance in 1959 cars. Whether Research or Motor octane number is more important varies with the car, engine speed and throttle setting.

2. A fuel property such as hydrocarbon composition and either Research or Motor octane also is a good index of road performance.

3. Low speed road performance in 1959 cars at full throttle operation depends primarily on Research octane number. For high speed, Motor octane is more important.

4. Experimental high compression cars were more ap-

preciative of Research octane number than the 1959 cars.

5. Part throttle road behavior is controlled almost entirely by Motor octane. An increase of sensitivity is generally detrimental.

6. Where Research octane is the same, fuels with maximum paraffin hydrocarbons give optimum road performance.

7. Where Research octane and sensitivity are the same, fuels with more aromatics and less olefins show better road performance at high speeds.

Scope of the Test Program

Fuels tested in this study were obtained from 114 refineries representing 77 percent of the motor gasoline produced in the United States and Canada.

More than 3,500 separate laboratory tests were made, including 1,820 CFR engine tests. And more than 16,000 road ratings were made—14,200 at full throttle and 2,000 at part throttle—with the fuel samples blended to a TEL concentration of 3.0 ml per gallon.

The empirical correlation between road antiknock behavior and the laboratory characteristics of current premium gasolines was exhaustively re-examined to provide an accurate, up-to-date means for study of current fuel performance in today's cars.

Work with experimental high compression engines produced data which will be of great help in predicting future fuel performance and requirements.

AVERAGE COEFFICIENTS IN EQUATION RELATING ROAD OCTANE NUMBER TO LABORATORY VARIABLES

$$\text{Road ON} = a + b\,(\text{Research ON}) + c\,(\text{Motor ON}) + d\,(\%\ \text{Olefins})$$

FULL THROTTLE

FIVE 1959 CAR AVERAGE	A	B	C	D
Modified Uniontown	28.90	0.419	0.325	-0.038
Modified Borderline				
2000 rpm	11.48	0.644	0.273	-0.027
2500 rpm	26.84	0.408	0.359	-0.054
3000 rpm	27.50	0.371	0.386	-0.083
3500 rpm	21.99	0.313	0.502	-0.107

How Ethyl Research can help you

Since 1946, Ethyl Research Laboratories in Detroit have studied laboratory and road performance of premium grade gasolines at periodic intervals. This recent program is the largest undertaken.

For oil company statistical groups that wish to make further computer analysis of the data, Ethyl Research will supply a deck of IBM cards containing all available fuel variables and all road ratings for fuels at full throttle. Cards also are available for part throttle ratings for 28 car-speed combinations on 30 fuels.

Copies of the report compiled on this program entitled, "1959 Premium Gasoline Antiknock Behavior," may be obtained from your Ethyl Representative. He will gladly arrange for a presentation by an Ethyl Refinery Technologist.

ETHYL ANTIKNOCK COMPOUND ETHYL CORPORATION

ETHYL CORPORATION
New York 17, N. Y.

Ethyl Corporation of Canada Limited, Toronto
Ethyl USA (Export) New York 17, N. Y.

RESEARCH LABORATORIES—Ferndale 20, Detroit, Michigan • Baton Rouge, Louisiana • San Bernardino, California

Lasting Protection

...WHERE DENSE CEMENT BACK OF THE PIPE IS ESSENTIAL

● Several conditions encountered down the well which could prove to be sources of trouble and expense can be readily avoided by placing a dependable Lone Star cement slurry back of the strings of pipe.

In the Gulf Coast, East Texas and similar areas, certain conditions can cause endless trouble, such as:

Contamination by oil-well fluids of fresh water sands near ground surface.

Hazards of gas seepage from high pressure gas formations to low pressure or dry sand formations.

Water leaks at the bottom of the well, causing a mixture of water and oil to come in, making necessary expensive remedial squeeze jobs.

Migration of well fluids from water sand to oil sand or vice versa.

Eliminate trouble at substantial savings in time and money by using Lone Star cements, performance-proved in thousands of wells under almost every conceivable oil-field condition.

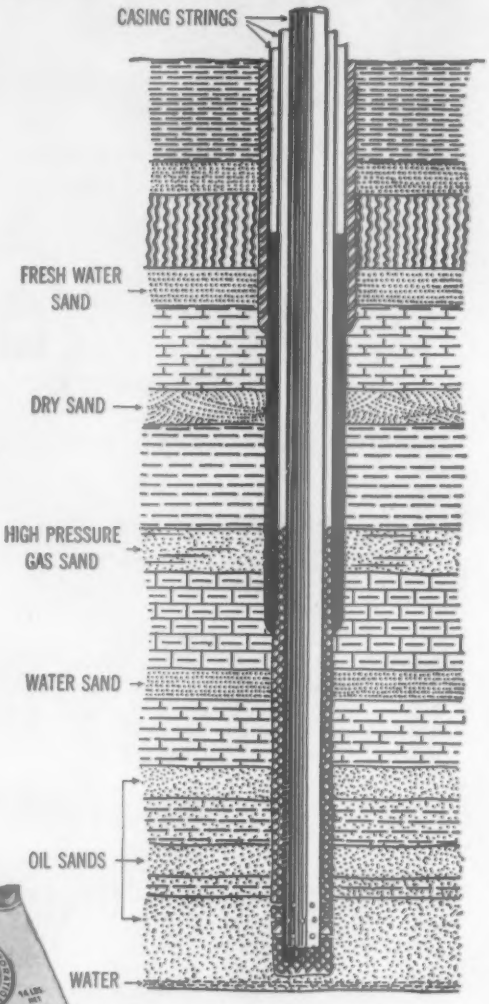
LONE STAR PORTLAND CEMENT—the standard of quality for a half century

'INCOR'* America's First High-Early Sulphate Resistant Cement

'STARCOR'* Slow-Setting Oil Well Cement

'TEXCOR'* Deep Oil Well Cement

*Reg. U.S. Pat. Off.



Oil well conditions typical of those encountered in the Gulf Coast, East Texas, and similar areas.

THERE'S A LONE STAR CEMENT FOR EVERY OIL FIELD NEED

LONE STAR CEMENT CORPORATION

Offices: DALLAS • HOUSTON • ABILENE, TEX. • LAKE CHARLES, LA. • NEW ORLEANS • BIRMINGHAM • KANSAS CITY, MO. • ALBANY, N. Y. • BETHLEHEM, PA. • BOSTON CHICAGO • INDIANAPOLIS • NEW YORK • NORFOLK RICHMOND • SEATTLE • WASHINGTON, D. C.

Depletion Treated Kindly by Critics

• Strongest proposal presented to committee studying ways to broaden the tax base is for further study to see whether there might not be a better method to provide incentive for oil men.

PERCENTAGE DEPLETION underwent a surprisingly mild attack in last week's hearing before the House ways and means committee.

There was some discussion by a few of the professors on the panel about whether there might be a better way of insuring adequate supplies of oil.

And the chairman of the committee, Rep. Wilbur Mills (D.-Ark.), expressed some doubts about the application of percentage depletion to operations abroad.

Perhaps of even more importance, many of the members of the important tax committee had nothing to say at all, thereby giving no indication of their views either at the start or the finish of the panel hearing.

But, based on the questions that were asked and the answers that were given, percentage depletion appeared to come through with flying colors.

This was the setting at the hearing:

There were five professors, two oil industry representatives and three spokesmen from mineral industries on a special panel to discuss percentage depletion.

They were heard, and questioned by, the House way and means committee, which is conducting an overall investigation of the tax structure with the aim of broadening the tax base, if possible, to provide more equity for taxpayers and to stimulate the economy.

Much agreement . . . The principal question regarding oil was whether percentage depletion is justified and, if so, on what grounds and at what level.

There was general agreement—even from the critics of percentage depletion—that this tax provision has undoubtedly helped stimulate exploration and drilling activity, thus enabling the industry to supply the nation with an adequate supply of oil and gas.

No one argued that the present prices of petroleum products are too high as a result of percentage depletion. Instead, there appeared to be complete agreement that these prices would be even higher without the tax provision.

No one challenged the need for adequate oil supplies as a national defense measure, and they all either said or indicated that percentage depletion has helped to attain this goal.

The chief dissident note, sounded by some of the professors on the panel, was this: The cost of percentage depletion may be more than the value gained, and there might very well be a better method to attain the goals that percentage depletion has helped the industry to achieve.

Even so, few concrete proposals of an alternative method were suggested.

More data needed . . . Instead, the strongest proposal made by depletion critics was that further study was needed to establish specific data on the cost of percentage depletion, the results, and the possibility of developing a better method of providing any needed incentive.

This attitude was summed up by Charles Galvin, professor of law at Southern Methodist University. Noting that percentage depletion has undergone repeated attacks and that it has been subject to numerous reviews by Congress, Galvin made this comment:

"It is my thesis that some rather detailed objective study must be made of economic data to show what this public benefit is, and to show that benefit in relation to costs so that we could know once and for all whether the method that we are using here really causes the reallocation that we want to cause."

OIL-INDUSTRY VIEW of depletion was presented by Scott Lambert, left, of Standard Oil Co. of California, and Richard Gonzalez, of Humble Oil & Refining Co.

COLLEGE PROFESSORS who questioned percentage depletion included, left to right: Horace M. Gray, University of Illinois; John A. Menge, Dartmouth College; Peter O. Steiner, University of Wisconsin; and Charles O. Galvin, Southern Methodist University.

Scott Lambert, of Standard Oil Co. of California, said he would welcome such a study. "I think the results would bear out some of the things we have claimed," he commented.

Abroad, too . . . The subject of the use of percentage depletion abroad was raised late in the day by chairman Mills.

Mills said he was "greatly concerned" by the application of this tax provision abroad, for it might not prove to be to the best interest of this nation.

He said he found it hard to understand why it is necessary, in the national interest, to encourage oil operations abroad when it is also found in the national interest to restrict the flow of that very oil into the U. S.

It seemed clear that Mills was setting the stage for a later attack on the use of percentage depletion overseas.

Lambert defended the present practice, maintaining that even if not a single barrel of oil were imported into the U. S., it would still be important to this nation that oil resources be developed in friendly countries around the globe—and that U. S. firms should participate in that development.

Professor Galvin commented that the present supply situation is a short-range problem, and that within a few years we would be needing more and more imported oil to meet domestic demand.

Mills then remarked that if this is so, "we are in a serious situation at home" as far as oil reserves are concerned.

Inconsistent? . . . Another question which cropped up was whether there is any inconsistency in encouraging oil production through use of percentage depletion while at the same time limiting domestic production and restricting imports.

Richard Gonzalez, Humble Oil & Refining Co., said this was not an inconsistency. Those who take such a view, he said, overlook the need for a reserve capacity for national defense purposes and fail to realize this nation's long-range oil needs.

Restriction of imports is not an indication that we have too much oil, he pointed out, but a demonstration of our concern that we were not developing our domestic resources rapidly enough to meet the nation's needs.

At this point, John Menge, Dartmouth College professor of economics, made the argument that in the face of such a situation we should not be "subsidizing" consumption of our present reserves, particularly if national security is an important consideration.

His contention was that we should use more foreign oil and "save" the domestic supply.

Gonzalez retorted that reserves were valuable only when developed and that it would be foolish to tie up capital in undeveloped reserves. Such an approach, he said, would be a far bigger cost to the taxpayer than the present system.

Subsidy hit . . . Mention was also made of the possibility of using outright subsidies—rather than percentage depletion—to assure an adequate supply of oil for national defense and national welfare.

Gonzalez and Lambert challenged this sharply. Lambert pointed out that under a subsidy an amount is allowed by the Government for a certain course of action whether or not the recipient is efficient or inefficient, productive or unproductive.

"Unlike that, the depletion allowance rewards the most efficient and the most successful in direct proportion to their success," he said. "The inefficient and the unproductive does not realize the benefit of this allowance."

Lambert also said it was his opinion—which is shared by others—that a subsidy would cost much more than the alleged tax cost of percentage depletion.

The cost angle . . . The professors and the industry spokesmen got into some debate over the proper calculation and evaluation of the cost of finding and producing oil.

Galvin, in response to a question from Rep. Frank Ikard (D.-Tex.), said that cost is the investment of the taxpayer in a property. At least, he said, that has been the traditional tax accounting view.

Lambert retorted that that was what was wrong with it—it was simply a tax accounting viewpoint.

"But Congress has recognized a different sort of capital for purposes of depletion," Lambert said. "How can one determine what the cost is of the ninth well that discovers a deposit? Has it been all of the wells previously drilled that were necessary in arriving at the one discovery?"

The exchange of comments between the panel members and committee members followed a summary by each panel member of the basic arguments he had presented in written papers submitted to the committee before it began its tax hearings in mid-November (OGJ, Nov. 9, p. 102, and Nov. 16, p. 132).

Canadian Gas-Export Picture Looks Brighter

• Energy board rulings expected soon enough to launch proposed projects in the spring. It would be first proposals approved in 3 years.

THE NATIONAL Energy Board will open its first gas-export hearings January 5 in Ottawa. All outstanding applications will be heard at one continuous sitting.

The industry is optimistic that decisions will be made in time to permit a spring construction start on most pipeline projects.

The board's announcement represents the first real break in a 3-year stalemate in the gas-export industry. No proposals have been approved since 1956, when Westcoast Transmission Co., Ltd., was given permission to export gas through its pipeline running from Peace River to the Pacific Coast.

The board will hear evidence on applications for exports totaling 863,750,000 cu. ft. of gas daily. They are:

. . . **Trans-Canada** Pipe Lines, Ltd., 204,000,000 cu. ft. daily to Midwestern Gas Transmission Co. at Emerson, Man., on the international boundary.

Trans-Canada also asks permission to export through Niagara, Ont., any surplus gas after meeting all its Canadian and Emerson requirements. No firm amount is specified, but it would not exceed 204,000,000 cu. ft. daily.

. . . **Alberta and Southern** Gas Co., Ltd., 458,750,000 cu. ft. daily to Pacific Gas Transmission Co. at Kingsgate, B. C., on the boundary.

. . . **Westcoast Transmission,** 165,000,000 cu. ft. daily, also for delivery at Kingsgate.

. . . **Canadian-Montana** Pipe Line Co., 36,000,000 cu. ft. daily for delivery to its own existing system in Montana.

There is also an application from Alberta Natural Gas Co., Ltd., for permission to build a 108-mile 36-in. pipeline from southwestern Alberta to Kingsgate. This is the line through which Alberta & Southern and Westcoast would ship their gas.

Trans-Canada asks authority to build a 30-mile 30-in. spur to connect its line with Midwestern's line at Emerson.

Trans-Canada and Westcoast ask for export licenses valid for 20 years. Canadian-Montana and Alberta & Southern are asking for 25-year licenses.

The hearings . . . It is presumed the hearings will last about 2 weeks. The board will spend a month considering the arguments. Rulings are expected to be delivered in all cases at the same time.

If the board can stick to this timetable, it means decisions will be rendered soon enough for the successful applicants to start construction in the spring.

Trans-Canada has already announced that a spring start would allow the company to commence deliveries at Emerson before the end of 1960.

More exports . . . In the meantime, Federal Trade Minister Gordon Churchill predicted that 1960 would see the start of increased export of Alberta gas to the U. S.

Churchill suggested that 1960 would be a "good year for Alberta gas. I think there will be an increased export of gas south of the border. This should stimulate both the oil and gas industries."

Gordon also said there is nothing the government can do about the sale of Venezuelan oil in Eastern Canada. "There are no prohibitions about the export or import of oil into Canada. The recent report of the Borden Commission did not recommend any change at the present time."

He declined to comment on the necessity for an energy treaty with the U. S. with regard to export of gas. "We have just set up our own National Energy Board—and I would prefer to see how that functions before taking any other steps."

Pressure Program Approved for Abell Field

THE TEXAS Railroad Commission has approved a pressure-maintenance project expected to add 9,500,000 bbl. of oil to total recovery from Abell Devonian field in Pecos and Crane counties, West Texas.

The water-injection program, projected by George T. Abell and William B. Neely, independent operators, would affect from 245 to 306 of the field's acres.

It would hike recovery in the 5,100-ft. Devonian from an estimated primary take of 8,150,000 bbl. to a total of 17,600,000. Estimates place 32,900,000 bbl. of stock-tank oil originally in the reservoir.

Plans are to inject water into the Devonian below the oil-water contact at a rate of 40,000 to 60,000 bbl. a month.

Daily injection rate would run from 1,500 to 2,000 bbl. daily through a single input well, the William B. Neely 3-A Renaud.

Abell Devonian, discovered in 1953, now has 17 producing wells on an average density of 20.4 acres per well. Cumulative production now stands at 1,260,000 bbl. Remaining life of the field under primary production was estimated by Abell and Neely at 102 years.

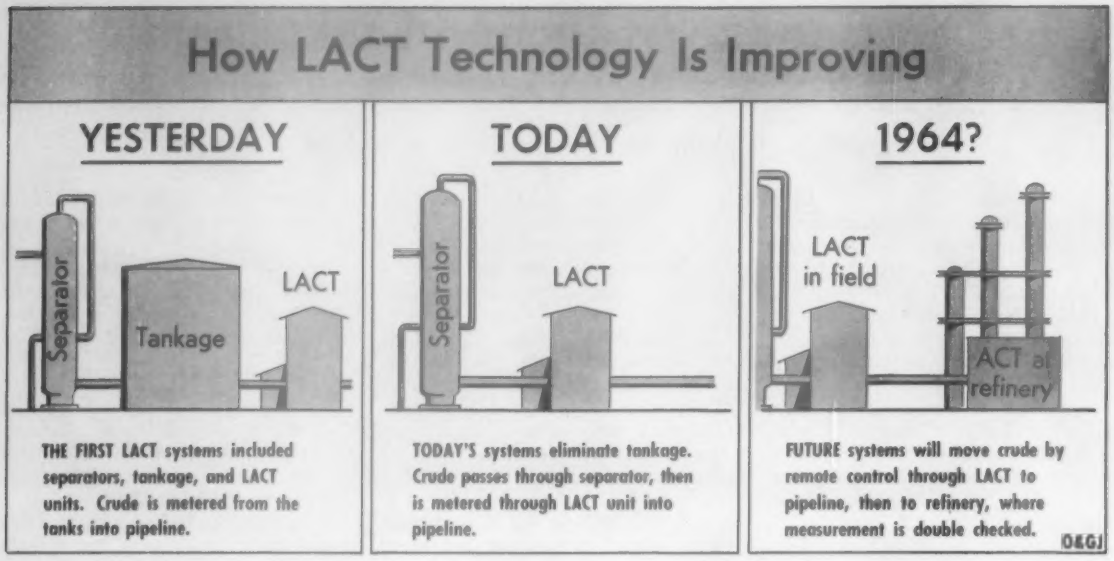
North Texas project . . . In other action, the commission granted in part Shell Oil Co.'s request for a capacity allowable for the big KMA waterflood-Southwest unit it operates in Wichita and Archer counties, North Texas.

The commission granted capacity allowables for unit wells 7 and 49 and pledged to grant similar allowables administratively for other wells in the unit upon showing by Shell that they have been stimulated by the flood.

The Shell-operated KMA unit takes in 4,640 acres which had produced a total of 21,839,000 bbl. of oil at the start of the flood in November 1958.

Initial injection has been limited to a 1,800-acre area to date in the first stage of the project. This area takes in 59 input wells and 60 producers and to November 1 had taken 5,502,915 bbl. of water.

John E. Springborn, Shell engineer, told the commission that the unit noted first response to injection last September. Prior to start of the flood, wells in the area were averaging about 2.5 bbl. daily each. Production from some of them now is exceeding the field top of 40 bbl. a day and the yardstick value for that depth of 64 bbl. daily.


How LACT Technology Is Improving
YESTERDAY
Separator
Tankage
LACT
THE FIRST LACT systems included separators, tankage, and LACT units. Crude is metered from the tanks into pipeline.
TODAY
Separator
LACT
TODAY'S systems eliminate tankage. Crude passes through separator, then is metered through LACT unit into pipeline.
1964?
LACT in field
ACT at refinery
FUTURE systems will move crude by remote control through LACT to pipeline, then to refinery, where measurement is double checked.
O&GJ

LACT: 4 Years Old and Growing Fast

• The units are rapidly being installed in fields throughout the oil patch. This fast acceptance of LACT has led some oil men to predict the automatic, remotely controlled oil field may be just another 5 years away.

LEASE AUTOMATIC custody transfer systems have mushroomed into general acceptance and maturity much faster than the most optimistic industry advocates dared predict a few years ago.

About 200 LACT systems have been installed since sale of the first tank of oil through a unit took place in December 1955—4 years ago. A few custom-built units had been built and used experimentally before that time.

First official industry recognition of LACT came in 1952 when the American Petroleum Institute created a LACT subcommittee under its committee on crude-oil measurement. This group held its first meeting in April 1953.

At the time, some subcommittee members predicted it would be 10 and perhaps 20 years before automatic-custody-transfer methods would gain acceptance. Now some of these same men are talking about remote control of a field by LACT within 5 years.

A prime example of how LACT can be used is the installation in Elk Basin field, where 12 units handle about 60,000 bbl. of crude daily. The field straddles the Wyoming-Montana line, but most of it is in northwestern Wyoming.

Pan American Petroleum Corp., operator in the field, has found LACT is a safer, more efficient operation. And more crude is being realized from the field since tankage and the vapor losses associated with tankage have been eliminated.

Two milestones indicate the speed with which the units have developed and been embraced by producer, pipeliner, and the industry generally.

... The API next year will adopt a set of standards governing use of the units.

Specifications will pinpoint minimum requirements of quality and performance. The API committee will meet next spring to screen proposed standards. Formal adoption is expected within 6 months. Joseph Zaba of Pan American, Tulsa, is chairman of the 30-man committee.

... A more detailed practices and procedures manual will be issued.

It will combine the thinking and experiences of many companies and of members of the committee. It probably will be ready for issuance by the summer of 1961.

Other factors show that LACT has come of age.

At the present, 30% of Pan American's production of about 285,000 bbl. daily is handled by LACT equipment, and wider use is planned by the company.

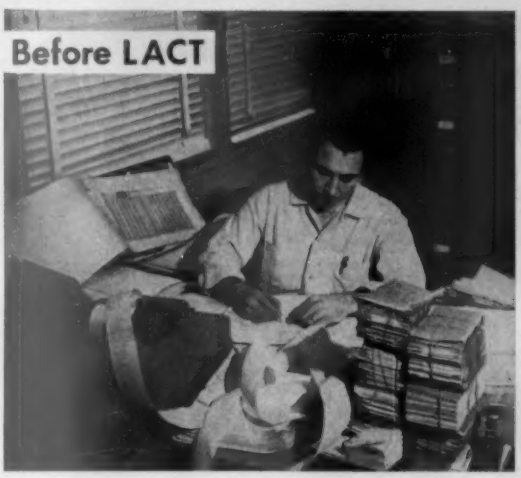
One-third of Carter Oil Co.'s 82,000-bbl. daily production now is metered through LACT units. This percentage is growing steadily. Automatic units will be installed in other fields where practical.

The cost of an LACT unit has been cut drastically. Six years ago, hand-built units cost up to $30,000. Large units today sell for about $8,000 and smaller ones for $3,000. There are 32 manufacturers now turning out automatic lease units. A big saving is in elimination of tank batteries. Only oil and gas separators and treaters are retained to team with LACT to handle field operations.

Automatic field . . . Some members of the API committee, swinging away from more conservative earlier viewpoints, now predict fully automatic oil and gas production within 5 years or so.

Using digital-computer programming, the new systems will allow complete remote control and operation of oil fields or individual wells in a field. These closed systems will operate with a metering LACT installation at the field and a second metering setup at the refinery, to double check runs.

Elk Basin story . . . Wyoming's largest

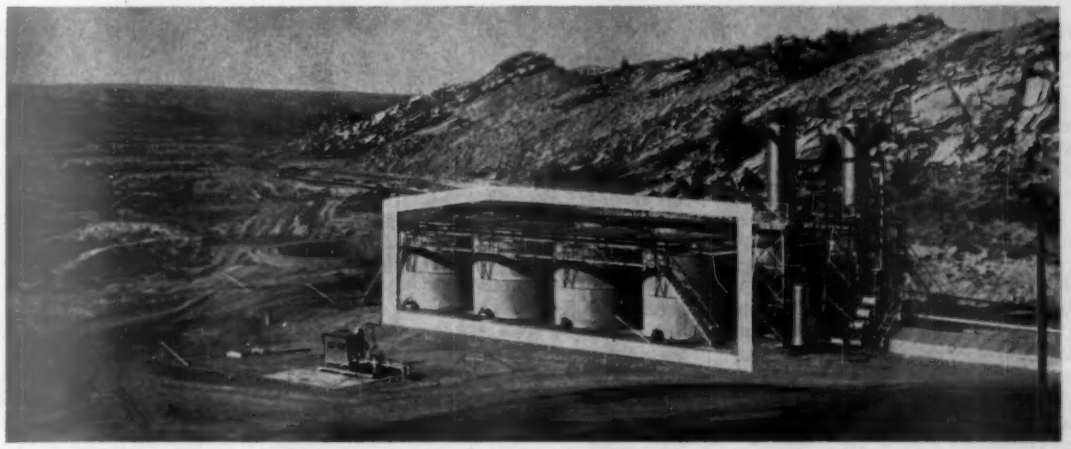


LACT does same job in less time, with less equipment

An LACT system can make a molehill out of a mountain of paper work. This is obvious to Ray Sanders, Pan American Petroleum Corp. clerk at Elk Basin field on the Wyoming-Montana border.

Before LACT was installed, Sanders' office processed 2,000 lease - to - pipeline run tickets monthly, left photo. Now that LACT is metering the crude, it requires only 12 tickets, right photo. It took 350 manhours to process the 2,000 tickets under the old system. With LACT doing the job, Sanders can handle the tickets in 2 hours.

LACT creates a David and Goliath format against Elk Basin's rugged terrain, lower photo. The LACT unit in the foreground will meter the crude into a pipeline, eliminating the need for the battery of eight tanks (enclosed in line).



oil field, the Elk Basin pool, is an example of a field that has been completely automated.

For the last 4 months, 12 units have been automatically measuring, sampling, recording temperatures, and running to the pipeline oil produced there.

Elk Basin LACT batteries handle an average of 60,000 bbl. daily. To December 1, approximately 14,240,000 bbl. of oil had been metered.

The first unit was installed at Elk Basin in 1957 by Pan American, the operator. It was a custom-built, dump-tank unit. A little later, a positive-displacement meter type unit was installed. Extensive testing of these two units was conducted and pipeline acceptance of the units came after about 10 months experimental use of each one.

Ten other units were installed and went into full-time operation almost immediately.

Elk Basin's score sheet shows these results:

... **Tanks with capacity** of 40,000 bbl., installed at an original cost of $160,000, are not needed and will be sold to defray cost of new equipment.

... **Value of the oil** produced is increased by eliminating evaporation losses of light hydrocarbons from the crude while in storage.

... **Paper and record work** has been slashed and personnel reduced with no loss in efficiency.

... **Safety on leases** has been increased by reducing human exposure to toxic hydrogen sulfide gas, produced with oil at Elk Basin.

DRILLING PANELISTS Harold Kelley, R. L. Guernsey, and Jack Abernathy agree . . .

50,000-ft. Hole Is Possible Now

• But it won't be drilled soon for the simple reason that it wouldn't pay out, panel agrees. And, they conclude, the production problem would be a lot tougher than the drilling problem.

AN OIL OPERATOR probably would have more trouble producing a 50,000-ft. well than drilling it.

But he's not likely to drill one that deep very soon. He can probably overcome mechanical problems. But the cost would be just too high and the payoff too poor to justify it.

That's the impression engineers took away last week when a panel of experts reviewed the problems involved in drilling and producing a 50,000-ft well. They appeared before a Tulsa luncheon of the American Society of Mechanical Engineers, Mid-Continent section.

The panelists were Jack Abernathy, vice president of Big Chief Drilling Co., Oklahoma City; R. L. Guernsey, field engineer for Jones & Laughlin Steel Corp., Pittsburgh; and Harold Kelley, chief engineer of the production department, Phillips Petroleum Corp., Bartlesville, Okla.

The drilling . . . Abernathy declared the drilling contractor could take a hole to 50,000 ft. with his present methods and materials.

The extremely heavy weights of tubing, high downhole pressures and temperatures would impose many tough problems, but they are not insurmountable, he said.

Abernathy advised the best strategy would be to drill as big a hole as possible because of the heavy strings and mud required. He outlined this drilling program:

. . . **Casing** — 12¼-in. hole with 9⅝-in. casing to 25,000 ft. with 18-lb. mud; then 8½-in. hole and 7-in. liner to 35,000 ft.; then 5⅝-in. hole and 4-in. liner to 50,000 ft.

Abernathy estimated the maximum load would occur at 25,000 ft. when the weight of the string in mud would be about 800,000 lb. The drilling industry already has set 9⅝-in. casing to 16,000 ft. and cut a 12¼-in. hole to 18,000 ft. He said it's not out of reason to believe drillers can extend this performance to 25,000 ft. and cut hole on down to 50,000 ft.

. . . **Drilling string**—4½-in., 20½-lb. pipe to 25,000 ft., 3½-in., 15½-lb. to 35,000 ft., and 2⅞-in., 11-lb. pipe to 50,000 ft. By careful selection, a string can be put together out of warehouse stock capable of going to the 50,000-ft. depth, he said.

. . . **Hoisting**—a hook load of 850,000 to 1,000,000 lb. can be expected. This means the drawworks now available can do the work if 12 lines are used in the derrick.

. . . **Wire lines** of 1⅜ to 1½-in. would be needed.

. . . **Auxiliary braking system** would be a problem because of extreme friction involved in running long strings of heavy drill pipe. Manufacturers, however, could easily meet the new requirements, Abernathy said.

. . . **Pumping hydraulics** would require pumps capable of 1,810 hydraulic hp. input operating at 500 psi. continuously.

. . . **Trip time** averaging one-half hour per 1,000 ft. of depth if no trouble is encountered would make a single trip at 50,000 ft. from 24 to 30 hours.

Abernathy cautioned that the high temperatures would require some sort of refrigeration to cool the mud, which probably could not have a water base. Modifications also would be necessary in present methods of cementing and logging.

Hard on tools . . . Guernsey said tubular requirements for a 50,000-ft. well would be governed by two big factors: Temperatures and pressure.

He calculated that a bottom hole temperature of 800 F. could be expected, with a possibility of heat exceeding 1,000° F. And bottom-hole pressure would be about 40,000 psi.

With these conditions in mind, Guernsey said three main objectives should be obtained for tubular design:

. . . **Hole size** at the bottom should be as large as possible.

. . . **Loads** on derrick should be held to a minimum.

. . . **Drill-pipe** sizes should be as large as possible to provide the best hydraulic system and torsion strengths.

Guernsey's recommendations were:

. . . **Casing**—13⅜-in. string to 15,000 ft., 9⅝-in. to 30,000 ft., 7-in. liner from 30,000 to 40,000 ft., and a 5-in. liner from there to bottom.

. . . **Tubing**—a 2⅞-in. string run from top to bottom with a 7.9-lb. per ft. pipe to 6,100 ft. and a 6.5-lb. per ft. pipe on down.

. . . **Drill pipe**—5½-in. to 13,000 ft., 4½-in. to 19,600 ft., and 3½-in. to 50,000 ft.

Guernsey declared the strings put together could drill and complete a 50,000-ft. well if the conditions assumed were true.

He added that more study and development are needed on effects of prolonged heat on pipe, on pipe-handling methods at the rig floor, on torque requirements necessary to rotate and drill to great depths, and on compression forces on surface casing from supporting intermediate and production strings.

A producer . . . Tough production problems at 50,000 ft. will challenge the ingenuity of the researcher, metallurgist, and the engineer, Kelley said.

He calculated temperatures would be 800 to 1,000° F. and maybe higher. Bottom-hole pressure probably would range from about 24,000 to 28,000 psi. if the productive zone outcrops at the surface or is connected to a permeable outcrop. If the reservoir fluids are trapped in a closed faulted segment, the formation pressure would approach 50,000 psi. This means a well-head pressure of 42,000 psi. for dry gas.

These conditions would present problems for:

. . . **Jet perforating.** Top performance now is perforation at 430° F. More work would have to be done on explosives, guns, and conductors for them to function at 800°-plus.

. . . **Electric logging.** Most equipment would have to be modified. Rubber-covered insulators become inelastic at 450° F., and available plastic coverings will withstand only 700° F.

Other electrical components also would have to be redesigned for use in high temperatures.

. . . **Casing and tubing.** New completion equipment and techniques would be required to prevent excessive buckling.

Heat of produced fluids would stretch the tubing string by 65 to 100 ft. This would require cementing the tubing and casing from top to bottom, using a telscoping tubing joint above, below, or within the downhole packer, and providing a tension-adjusting type wellhead.

. . . **Surface facilities.** Extensive auxiliary cooling of the flow stream will be necessary for efficient gas-liquid separation.

Present christmas trees must be improved to handle the excessive heat and pressures expected. New materials for packer elements also would be needed. Corrosion would become a critical problem calling for new inhibitors and coatings.

. . . **Lifting.** Only gas lift could be successfully employed if, by chance, the 50,000-ft. well did not flow naturally. Other types of artificial lift would fail.

A sucker rod string, for example, to handle a 1-in. diameter plunger at this depth would have to be 6½-in. diameter at the top.

In a question-answer session closing the meeting all three authors agreed problems presented by drilling and producing a 50,000-ft. well are not insurmountable.

But, they added, the discussion is academic now because such a well wouldn't pay out.

Texas Tries Experiment in Public Affairs

A UNIQUE petroleum-industry conference will be staged in Midland, Tex., this week.

It will serve as a trial balloon to determine whether such conferences can be effective in arming oil men with facts needed to defend and promote their industry whenever the occasion arises.

If the West Texas meeting is successful, many more like it will follow next year in other areas all over the state.

The Midland conference, slated for December 8 and billed as a public-affairs conference for oil-industry people, is a brainchild of the West Texas Oil Information Committee of the Texas Mid-Continent Oil and Gas Association.

Widely publicized . . . indications are that maximum attendance of 300 from the committee's 19-county West Texas area will easily be met.

The committee is concentrating its invitations to oil companies, independent operators, and supply firms on the top management group and other key personnel.

Letters were sent out by Joseph I. O'Neill, Jr., Midland, Permian basin district vice president for Texas Mid-Continent; Ken Shaffer, president of Standard Oil Co. of Texas and chairman of the state OIC operating committee; and Roy Minear, conference chairman.

Program runs gamut . . . The 300 participants in the conference will get a thorough briefing on current issues affecting the industry on local, state, and national levels.

All told, a dozen talks will be packed into a tight session running from 8 a.m. to 2:45 p.m.

Leading off will be Charles E. Simons, executive vice president of Texas Mid-Continent, presiding and speaking on "Why We Are Holding These Conferences."

Following will be talks on:

"What Your Neighbors Think of Your Industry," Joe Belden, president of Belden Associates, Dallas.

"Why Our State Government has a Perpetual Money Crisis," Fred H. Husbands, executive vice president and general manager of the West Texas Chamber of Commerce.

"The Oil Industry's Tax Position," William H. Abinton, Texas Mid-Continent attorney.

"Where Do We Stand in Washington on the National Fuels Policy and on Marketing Regulations," Harold Skinner, vice president of Continental Oil Co.

"Where We Stand in Washington on Depletion and Natural-Gas Regulation," Martin A. Row, Sun Oil Co. attorney.

"Let's Protect Our Gasoline Tax Dollars," Marvin Miller, vice president of Cosden Petroleum Corp.

"Gasoline Is Cheap—Don't Let Our Critics Forget It," Val Jean McCoy, public-relations man for Shell Oil Co., Houston.

"Why Write Your Congressman?", Jake Jacobsen, Continental Oil Co. attorney, Austin.

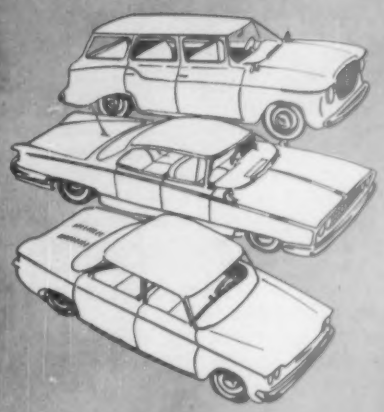
"A Check List for Organization and Action," K. H. Shaffer.

"If the Press Doesn't Have Your Story, No One Has It," Jim Watson, oil editor of the Midland Reporter-Telegram.

"Have We Enough Time Left To Do the Job?," Horace Busby, president, Business Research Corp. of Texas, Austin.

The 1960 Cars

New makes, more models, many changes . . . for the refiner, compression ratios and horsepower are down slightly.



Buick	V-8	2 bbl.	9.0	10.5	−1.5	235	250	−15
	V-8	2 bbl.	10.25	10.5	− .25	250	325	−75
	V-8	4 bbl.	10.25	10.5	− .25	325	325	....
Cadillac	V-8	4 bbl.	10.5	10.5	.....	325	325	....
	V-8	3, 2 bbl.	10.5	10.5	.....	345	340	+ 5
Chevrolet	6	1 bbl.	8.25	8.25	.....	135	135	....
	V-8	2 bbl.	8.5	8.5	.....	170	185	−15
	V-8	4 bbl.	9.5	9.5	.....	230	230	....
	V-8	4 bbl.	9.5	9.5	.....	250	250	....
	V-8	3, 2 bbl.	9.5	9.5	.....	280	250	+30
Corvair	6 Flat	2, 1 bbl.	8.0	....	.....	80	...	....
Chrysler	V-8	2 bbl.	10.1	10.1	.....	305	305	....
	V-8	4 bbl.	10.1	10.1	.....	325	325	....
	V-8	4 bbl.	10.1	10.0	+ .1	350	350	....
Dodge Dart	6	1 bbl.	8.5	....	.....	145	...	....
	V-8	2 bbl.	9.0	....	.....	230	...	....
	V-8	4 bbl.	9.0	....	.....	255	...	....
Dodge	V-8	2 bbl.	10.0	10.1	− .1	295	295	....
	V-8	4 bbl.	10.0	10.1	− .1	325	320	+ 5
	V-8	2, 4 bbl.	10.0	10.0	.....	330	345	−15
De Soto	V-8	2 bbl.	10.0	10.0	.....	295	290	+ 5
	V-8	2 bbl.	10.0	10.1	− .1	305	305	....
	V-8	4 bbl.	10.0	10.1	− .1	325	325	....
	V-8	2, 4 bbl.	10.0	10.1	− .1	330	350	−20
Ford Falcon	6	1 bbl.	8.7	....	.....	90	...	....
Ford	6	1 bbl.	8.4	8.4	.....	145	145	....
	V-8	2 bbl.	8.8	8.8	.....	185	200	−15
	V-8	2 bbl.	8.9	8.9	.....	235	225	+10
	V-8	4 bbl.	10.0	9.6	+ .4	300	300	....

Octane Race Appears to Be Stalled

THE 1960 model cars are following the script. They're pretty much as predicted, with average compression ratio, horsepower, and displacement down slightly.

This means refiners may look for a second year of relaxed octane requirements from Detroit in 1960.

But, if close observers are right, this may be the lull before the storm. Here's the outlook:

After this year, the octane needs of new cars are expected to shoot up fairly fast — compact cars notwithstanding.

High-requirement cars may be demanding octanes on the order of 103 RON by 1964. By then, even cars needing "regular" may take fuels close to today's premiums.

The slight reduction in average compression ratio, horsepower, and displacement doesn't mean the car makers have reached a plateau. Several developments indicate differently. For instance:

. . . **Pontiac's 10.75:1** compression ratio. This new higher ratio, optional on six different Pontiac models, helped Pontiac chalk up the biggest sales gain in the medium-price class, pushing Pontiac well in front of its field. Other manufacturers can't let it stay there alone.

. . . **Chrysler's ram induction.** This option is available on Dart, Plymouth, Dodge, and DeSoto. Ram induction has a supercharging effect. Some see it as a more significant development than General Motors' heralded fuel injection, which has been abandoned.

. . . **Compact-car variances.** Vast differences mark the five domestic makes competing for the compact-car market. If buyers put their customary preference on performance, some will have to improve to equal the others. And those now in front will have to improve to stay ahead.

Compression ratios . . . A simple average of the compression ratios of the 62 1960 models is 9.31:1.

That's a sharp drop from the 1959 average of 9.5:1 and is even below 1958's 9.47:1. It's a step backward, but experts don't see any lasting significance to it.

One expert foresees not only a recouping of this year's losses in compression ratio but also a sharp increase in the next 5 years. He predicts that models of high-requirement cars, those needing premium or superpremium gasoline, will average 11.25:1 in compression ratios by 1964. And he puts low-requirement cars, those satisfied with regular, up to 10.2:1 in 5 years.

If the observers are correct, the

Imperial	V-8	4 bbl.	10.1	10.1	.....	350	350	....
Lincoln	V-8	2 bbl.	10.0	10.0	.....	315	350	—35
Mercury	V-8	2 bbl.	8.9	8.75	+ .15	205	210	— 5
	V-8	2 bbl.	8.5	10.0	—1.5	280	280	....
	V-8	2 bbl.	10.0	10.0	.....	310	322	—12
Oldsmobile	V-8	2 bbl.	8.75	9.75	—1.0	240	270	—30
	V-8	2 bbl.	9.75	9.75	.....	260	300	—40
	V-8	4 bbl.	9.75	9.75	.....	315	315	....
Plymouth	6	1 bbl.	8.5	8.0	+ .5	145	132	+13
	V-8	2 bbl.	9.0	9.0	.....	230	230	....
	V-8	4 bbl.	9.0	9.0	.....	260	260	....
	V-8	4 bbl.	10.0	10.1	— .1	305	305	....
	V-8	2, 4 bbl.	10.0	....	.....	310	...	....
Pontiac	V-8	2 bbl.	8.6	8.6	.....	215	215	....
	V-8	2 bbl.	10.25	10.0	+ .25	283	245	+38
	V-8	4 bbl.	10.25	10.0	+ .25	303	260	+43
	V-8	3, 2 bbl.	10.75	10.5	+ .25	318	345	—27
Rambler	6-L	1 bbl.	8.0	8.0	.....	90	90	....
	6-Ovh	1 bbl.	8.7	8.7	.....	127	127	....
	6-Ovh	2 bbl.	8.7	8.7	.....	138	138	....
	V-8	2 bbl.	8.7	....	.....	200	...	....
	V-8	4 bbl.	8.7	8.7	.....	215	215	....
	V-8	2 bbl.	8.7	....	.....	250	...	....
	V-8	4 bbl.	9.7	9.7	.....	270	270	....
Studebaker	6	1 bbl.	8.3	8.3	.....	90	90	....
	V-8	2 bbl.	8.8	8.8	.....	180	180	....
	V-8	4 bbl.	8.8	....	.....	195	...	....
	V-8	2 bbl.	8.8	....	.....	210	...	....
	V-8	4 bbl.	8.8	....	.....	225	...	....
Valiant	6	1 bbl.	8.5	....	.....	101	...	....

1961 and Beyond?

Compression ratios

. . . due to climb again.

Octane number

. . . on the order of 103 by 1964.

Horsepower

Ford's 360-hp. may herald another climb.

Compacts

. . . off to fast start, but future still question mark.

—But Maybe Not for Long

long-term upward swing in compression ratios will resume next year. That means that such ignition problems as rumble, thud, and wild ping will be back in the news again.

Mass introduction of the domestic compact cars was chiefly responsible for the drop in average compression ratio in the 1960 models. While there were a few more reductions than increases among the standard-size models, all but two changes were relatively insignificant. Buick made the sharpest reductions and Pontiac the sharpest increases.

Buick cut back one of its 364-cu.-in. engines from 10.5:1 to 9.0:1. Another 364-cu.-in. engine and the 401-cu.-in. engine were dropped from 10.5:1 to 10.25:1. Horsepower on the two smaller engines was reduced 15 and 75 respectively.

Pontiac boosted the compression ratio on all but its economy model by 0.25. The 10.75:1 ratio of its top power plant, equipped with three two-barrel carburetors, has an advertised horsepower of 318 at 4,600 r.p.m.

Compression area is one area where the differences in the compacts show up. Chevrolet's Corvair and the Rambler American, with 8.0:1, are at one extreme. They range from there up through Studebaker Lark's 8.3:1, Chrysler Valiant's 8.5:1, to Ford Falcon's 8.7:1.

Horsepower . . . There are 12 reductions in horsepower, compared with 8 increases.

The two Buicks, Lincoln, and Oldsmobile dropped the most. Part of this was to qualify the smallest Buicks and Oldsmobiles as "economy cars," capable of being satisfied with regular. Pontiac, as part of an obvious effort to hold its improved position in the field, upped the horsepower of two of its middle engines.

A strong indication that the horsepower race is not over is the report that Ford will bring out a 360-hp. option some time in 1960. The engine, with 10.6:1 compression ratio, would be the most powerful available. It would exceed the horsepower of the Imperial, the only 1960 model to claim 350 hp.

There is a wide range in horsepower in the compact cars. Corvair's 80 hp. is the lowest in the field. The 101-hp. Valiant is at the top. In between are the Lark and Falcon, each with 90 hp.

Displacement . . . There were very few changes in displacement among the standard-size makes.

Most significant were the reduc-

tions made by Buick and Oldsmobile in their "medium" engines. Buick now has two 364-cu.-in. engines instead of one and one 401-cu.-in. engine against two a year ago. Oldsmobile now has two 371-cu.-in. engines instead of one and one 394-cu.-in. engine, compared with two a year ago.

Here again the vast variances in the compacts show up. The Corvair is low at 140 cu. in. and the Falcon is not much bigger at 144 cu. in. Then come the Lark 6 at 160.6 cu. in. and the Valiant at 170 cu. in. The Rambler six-cylinder tops them all with 196 cu. in.

Compact cars . . . Spurred by novelty appeal and the success of their predecessors, the new compacts got off to a very fast start. But it will be at least several months before there is a reliable indication of which will make the grade in a big way.

Their higher-than-expected delivery price, $2,400 to $2,500, has yet to deter sales. It puts that much higher premium on performance.

Some experts think that the Valiant, because of its higher horsepower, greater displacement, and more varied models, is the most likely of the Big Three compacts to hold its own against the established Rambler and Lark.

There is some doubt that the new compacts will meet advertised mileage claims. Press releases on some claimed 30 miles or better per gallon. However, one driven from Detroit to the coast averaged 24.4 miles per gallon. Another, driven at 50 m.p.h. on a 500-mile run on a test track, averaged 19.7 miles per gallon.

Just what the new compacts' gasoline requirements will be remain to be seen. It'll take some time to reach equilibrium deposits, but up to now the Ford Falcon seems to have the most modest fuel requirements. At least they were a little less than the Corvair's in a single inconclusive test.

Dodge's new Dart is built to compete with the small Fords, Chevrolets, and Plymouths. Its engine is identical with the Plymouth's smaller models in displacement, horsepower, and compression ratio. Its wheelbase is the same as that of its immediate competitors.

Ford's Comet, due to make its debut in the spring, will be an in-between competitor. It will be smaller than the Ford, Chevrolet, Plymouth, and Dart, but its 114-in. wheelbase will make it bigger than any of the compact cars. Its expected horsepower, 100, will also put it between the small standards and the compacts.

Engine design . . . The cars will be the focus of attention in 1960, but there will be more than one eye cocked on the ram-induction principle introduced by Chrysler Corp. on the Dart, Plymouth, Dodge, and DeSoto.

It's still an extra-cost option. The suggested price for the Dodge, for example, is $332. This makes it comparable in cost to fuel injection, and it will surely mean limited use in 1960.

One engineer said the ram manifold application looks more effective than fuel injection. He said it has the same effect as supercharging but without its disadvantages. No moving parts are involved and no power is taken from the engine.

Applying the ram-manifold system entailed unusual engine design. It has long, curving intake-manifold tubes which force air and fuel into the cylinders at hundreds of feet per second.

The column of air-fuel mixture in one of the long manifold branches keeps moving into the combustion chamber as long as the intake valve is open. The motion of the valve sets up a compression wave in the manifold tube and the wave travels back and forth in the tube at the speed of sound.

The length of the tube is tailored so that, at the engine speed range where increased performance is desired, the compression wave arrives at the valve when it is open. The great pressure of the compression wave, pulsating back and forth within the tube, rams the air-fuel mixture into the combustion chamber to provide a supercharging effect.

Ram induction, Chrysler engineers claim, provides peak performance where it is most needed. This is the middle speed range, from 20 to 60 m.p.h. It gives extra passing power at normal speeds and fuel economy equivalent to normal engines under part-throttle driving conditions.

Engines in many other Chrysler Corp. cars this year are inclined at an angle of 30°. This enables them to have longer than normal aluminum manifold branches so that they, too, get some of the benefits of the ram-induction principle. Plymouth claims it gives the driver 8 to 10 more miles per tankful of fuel.

Another advantage is that it helps keep the car's center of gravity low and permits a lower hood to cut down wind resistance.

"One half of any ordinary car's fuel is required to overcome wind resistance at a speed of 40 m.p.h. Design, therefore, is half the problem of fuel economy," Plymouth engineers say.

There will be more makes and models of new cars on the road next year than any year since World War II. And it will start a marked change in the character of the car population. It will increase the trend, begun in 1959, to emphasize regular—but don't bet that it'll stop the long-time trend toward higher-quality premium.

watching WASHINGTON

Clyde La Motte

• Coal will attack new resid quotas

THE COAL INDUSTRY WILL RAISE considerable hue and cry when the oil-import quotas for the first 6 months of 1960 are announced.

Chief complaints will be directed at the increase in quotas for residual-fuel imports (probably around 100,000 bbl. daily initially).

This is the coal industry argument: There is ample coal to supply any and all residual-fuel to consumers who have facilities to convert to solid fuel. If these consumers should switch to coal, then there would be no need for boosting residual-fuel quotas.

Such an approach, they say, would reduce this nation's dependency on foreign supplies of residual fuel while, at the same time, strengthening a vital domestic industry-coal.

The coal industry, determined to make its voice heard more strongly in Washington, will muster political pressure on the residual-fuel import issue.

Sen. Robert Byrd (D.-W. Va.) has already risen to the occasion. He fired a letter of protest to Interior Sec. Fred Seaton shortly after the latter had mentioned at a

Study Shows Trading Stamps Not Much Help

TRADING STAMPS are not too effective in stimulating gasoline sales. While 33 to 40% of all service stations issue stamps, only about half of these enjoy increased business because of them.

A survey by the University of Iowa for the American Petroleum Institute's Division of Marketing discloses that:

... **Average cost** is 0.92 cent for each gallon of gasoline sold.

... **One-fourth** of all stamps are issued on taxes, a strictly nonprofit item.

... **Stations using stamps** sometimes curtail other services and cut promotion expenses.

... **Other stations** retaliate by cutting prices, offering giveaways, or giving hidden discounts to regular customers.

Among advantages mentioned in the report are increased volume of business, possibly higher prices for products because customers are less cost conscious, more "fillups" per customer visit, better collections, and automatic attraction of new customers and tourist business.

Disadvantages include the fact that extra cost of stamps is difficult to absorb, they are a nuisance to handle, and sales increases are in the low-profit items rather than the better paying TBA and service sales. They also represent about 2% of the total station sales and in a typical station, they incur an additional monthly expense of $102 to $250. This is the third largest expense item for these stations, exceeded only by labor and occupancy.

TRADING STAMPS go with many gasoline purchases.

Use of stamps has increased in the last decade but rate of expansion now has leveled and "the proportion of stations using stamps is not likely to increase," the report says. "Total number of stations using stamps may decline but stamps will continue to be an important factor in retailing of gasoline."

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press conference the likelihood that residual-fuel quotas would be increased.

Other coal-state congressmen will no doubt follow Byrd's move, and it could lead to a congressional committee "investigation" of the oil-import control program if the import program officials stand firm.

• Natural gas: Oil's biggest problem?

A WELL-KNOWN PETROLEUM ECONOMIST, peering into the future, foresees natural gas as the No. 1 problem of the oil industry.

And, as he sees it, the one who will bear the brunt of that problem will be the producer.

The economist, who asked that he not be identified, uses this line of reasoning:

Oil now pays far more than its proportionate share of the cost of oil and gas production even though the two are often competitors for the same market. Thus, as the use of natural gas continues to increase, the burden on the producer will become greater—and oil will become less and less able to compete.

Eventually, this would lead to a decrease in drilling for oil, and that in turn would reduce the supply of natural gas because relatively little drilling is done for gas alone.

The economist indicated that if this sort of vicious cycle is to be prevented, the industry should apportion a more realistic share of the cost of oil and gas production to gas.

Such a move, he feels, would have this result: Oil, freed from "subsidization" of natural gas, would be able to compete more vigorously, particularly for markets a considerable distance from the producing regions.

With more markets opening up for oil, drilling would be stimulated. This, in turn, would help insure a continuing supply of natural gas.

He made it clear that he feels the problem is up to the industry. Certainly, state and federal agencies regulating natural-gas prices won't press for a greater allocation of oil and gas costs to natural gas.

• TBA marketing to be probed again

TBA MARKETING PRACTICES will again come under the scrutiny of a House subcommittee this week.

The subcommittee, headed by Rep. James Roosevelt (D.-Calif.), is holding a 3-day hearing. It will seek to determine whether competition in the sale of tires, batteries, and accessories is being unduly restricted.

Witnesses will be principally jobbers and retailers, apparently drawn from a list of those whose registered complaints in questionnaires circulated some time back.

It is likely that the main purpose of the hearing will be to air complaints by jobbers or dealers that they were "coerced" by their oil supplier into handling a particular line of TBA.

There was no indication, just prior to the opening of the hearing, that suppliers would be given an opportunity to state their position.

Drilling Contractors Team Up to Cut Costs

• Idle rigs go back to work as three contractors form a fourth company to solicit business and do the bidding.

THREE New Orleans drilling contractors who operate six inland barge rigs in South Louisiana have pooled their resources in a unique money-saving business-getting plan that already has put their six idle rigs to work.

The method of operation has never been tried before, and it may set a pattern for other hard-pressed drilling contractors.

Each company is keeping its corporate identity, but the three have organized a joint fourth company that pays overhead costs and solicits drilling jobs. They estimate they have cut their daily overhead of $100 per rig to $50 in the few weeks they have operated.

Joining forces in the new venture are Continental Drilling Co., Inc. (one rig), M. A. Smith Drilling Corp. (three rigs), and Continental Shelf Drilling Corp. (two rigs). The fourth company they organized is Continental Rigs, Inc.

The presidents of the three member-companies are the chief officers of Continental Rigs. Marshall A. Smith, Jr., of Continental Drilling, is the president of Continental Rigs. Marshall A. Smith, Sr., of M. A. Smith Drilling, is chairman of the executive committee. Joseph M. Rault, Jr., of Shelf Drilling, is chairman of the board.

Although the two Smiths are father and son, no stockholders in any of the three companies hold stock in the other two.

New business . . . Marshall A. Smith, Jr., said last week that when the new company was organized in October, the six barges, representing a $4.5-million investment, were idle.

Today the six are drilling for Gulf, Sun, Cabot Carbon, Republic Natural Gas, Union Producing, and Panotech.

Aside from cutting overhead costs, the basic value of pooling operations lies in the ability to bid on jobs for specific rigs, Smith said.

This cuts down on moving costs and eliminates downtime.

As the prime example of how this works, Smith said that when the company was formed all six rigs happened to be down. While the three companies, acting separately, probably would have had a chance to bid on new jobs, they could make better bids through Continental Rigs by parceling them out according to the location of the rigs.

"By having a choice of rigs, we could do it," he said.

Drilling contracts are made by the member companies, not by Continental Rigs.

While the arrangement is still too new to draw any firm conclusions as to its value, Smith said that already other contractors have talked informally with the new company about joining in.

Smith believes that Continental Rigs could handle about 15 to 20 rigs economically. The company plans at this time to stick to inland water drilling, although it sees no reason why the method could not apply just as well to land drilling.

Costs prorated . . . A system for prorating costs has been established for the member companies, based on total revenues and expenditures of each company.

All three have moved their offices to the same location in the Commerce Building at New Orleans. Continental Rigs employes a drilling superintendent, a chief engineer, and a general manager for all three companies.

Smith was asked why the three companies did not effect a general merger inasmuch as their operations were so closely tied together. He replied that neither he nor the others in the venture wanted their respective companies to quit business.

The new arrangement also has the obvious advantage of making it easier for other contractors to participate and still remain in business for themselves.

Smith said there is no tax advantage involved—"except that we hope to make enough money to pay some taxes."

He conceded that "poor times" in the drilling business was the stimulus behind the plan and that daily overhead is threatening to force a number of contractors out of business.

INDUSTRY BRIEFS . . .

Continental Oil Co. has purchased Westex Oil Co., Odessa, a petroleum marketing firm. Westex owns 25 stations in West Texas and southeast New Mexico and formerly distributed petroleum products of Shell Oil Co. Conversion to Conoco products will be completed this week.

Geophysical Integrators, San Angelo, Tex., is merging into Independent Exploration Co., Houston. Edward M. Handley, president of Geophysical Integrators, will become a vice president and manager of the Weight Dropping Division of Independent Exploration. T. I. Harkins will continue as president of Independent Exploration. The Weight Dropping Division, which will headquarter in San Angelo, will continue to develop the weight-dropping seismic technique which was a specialty of Geophysical Integrators.

Producing Properties, Inc., Beverly Hills, has acquired interests in several Texas and California properties for $1,460,000. They include eight wells in Reeves San Andres field, Yoakum County, Texas; five wells in the Skillern Survey of East Texas; and a small royalty interest in 56 wells in East Texas field. In California, the firm bought a one-fourth interest in five wells in the Bradley Land Co. area of Santa Barbara County.

Buttes Gas and Oil Co. has completed purchase of the Sutter City Community lease in the Sutter City gas field in California's San Joaquin Valley. Buttes paid Richfield Oil Corp. $465,000 for its half interest in the field.

Tidewater Oil Co. will keep its southern division accounting, traffic, treasury, and tax departments in Tulsa. In March, the company announced it was moving central division offices from Tulsa to Houston and consolidating it with the southern division (OGJ, Mar. 16, p. 89). The company, however, has already moved the executive, production, land and exploration, and legal departments, to Houston.

Tennessee Gas Transmission Co. has taken over East Tennessee Natural Gas Co. in a stock deal involving $12.5 million to $15.5 million in securities.

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Isolated Price Cuts Jar U. S. Crude Market

• New postings for Saskatchewan and Gulf Coast oil probably won't start a general decline, but crudes in the Rockies, Mid-Continent, and Gulf Coast could feel the pressure as marketers reexamine their prices.

DOMESTIC crude prices felt the pressure of price cutting in such widely separated areas as Saskatchewan and southern Louisiana and East Texas.

Other buyers did not immediately follow the price cutters, but the new postings placed every company's schedules under close comparative study.

The cuts were made by:

. . . **Great Northern Oil Purchasing Co.,** which lowered its price on Midale-type crude 22 cents a barrel from $1.945 to $1.725. About 10,000 bbl. daily of crude is involved.

. . . **Tidewater Oil Co.,** which posted cuts ranging from 7 to 24 cents a barrel on oil from Venice field, La., and 30 cents on Conroe field, Texas.

New prices in Venice field range from $3.23 a barrel for 40°-gravity and above with a 3-cent differential downward to $2.72 for 23-23.9°-gravity oil. Old prices ranged from $3.30 to $2.96 on a 2-cent differential.

Conroe flat prices went from $3.53 to $3.23. Tidewater buys about 12,000 bbl. daily in Venice field and 5,000 bbl. daily in Conroe.

Tidewater is the only buyer in Venice. Others who post prices for Conroe are Humble, Sun, and Texaco.

The repercussions . . . Refiners are sensitive to areas of low crude prices, and cuts in one area usually set off a series of price changes.

The Midale-type crude of Saskatchewan has been delivered to the St. Paul, Minn., refining area by pipeline at a price comparable to Chicago prices. This crude and its products compete in some areas with crude and products made from Rocky Mountain and Mid-Continent crudes. A cut in Midale-type oil thus has a reaction among refiners who run Rocky Mountain or Mid-Continent crudes.

Some marketers, however, doubt that the Great Northern cut will have an adverse effect now on domestic crudes, because of the type of crudes involved.

The Midale-type crude comes in a light gravity of 33-34° and heavy gravity of 25° and sour. The light crude, found chiefly in the northern part of Weyburn field, has a ready market with Imperial.

The heavy, sour crude is penalized by its refining characteristics. It yields very little gasoline or asphalt. It gives a disproportionate yield of regular-grade residual fuel.

Great Northern has been a major buyer of this crude, having a market for it in addition to its own refinery. Oil men speculate that Great Northern cut the price because it lost this secondary market and because independent producers of the heavy crude undermined their own price by peddling oil under Great Northern's postings.

Marketers feel that this price trouble will not spread because U. S. crude of the same quality does not come into direct contact with the Midale-type oil.

Competitive crude out of the Rockies moves by pipeline to the Mississippi River and is barged to the St. Paul area. The river is now closed for the winter, however, and this movement has stopped.

Crude coming into Minnesota by tank car from North Dakota is light crude with high gasoline content but little heavy-fuel yield. Also, there is a good demand for heavy fuel at this time of the year which should buoy prices.

What happens in the next month or so could change this. If the Saskatchewan sour crude begins cutting into the Great Lakes refining market, refiners might penalize Rocky Mountain sour and Mid-Continent sweet.

Gulf coast prices . . . What will happen to Gulf Coast prices following Tidewater's action is difficult to assess.

The reductions in Venice field in Plaquemines Parish now make Tidewater's price equal to prices posted by Gulf at its Ostrico terminal. Tidewater barges all the Venice crude to the Ostrico terminal where it's loaded on tankers.

The 3-cent downward differential which Tidewater imposed on Venice field crude is in line with a trend started in the last year or so to price crude nearer its refining value.

The 30-cent cut in Conroe field may have stemmed from loss of a market. Tidewater reportedly does not use any of its Conroe purchases at its refineries. Of the 16,000-bbl.-daily production in Conroe, Humble is by far the major buyer at 8,000 bbl. daily. Bulk of this is Humble's own oil. Sun and Texaco are smaller buyers and producers.

Even if the entire Conroe production suffers a price cut, it may not spread because the Conroe crude is a high specialty oil—excellent if a refiner is equipped to handle it, but a problem if not. It has carried a high price tag for many months and still after Tidewater's cut is 10 cents a barrel higher than it was prior to the 1957 price increase.

Trans-Canada to Buy Ontario Gas Leg

TRANS-CANADA Pipe Lines, Ltd., plans to buy the government-owned northern Ontario leg of its Alberta-Montreal gas line November 1, 1961.

The purchase price is estimated at around $130,000.

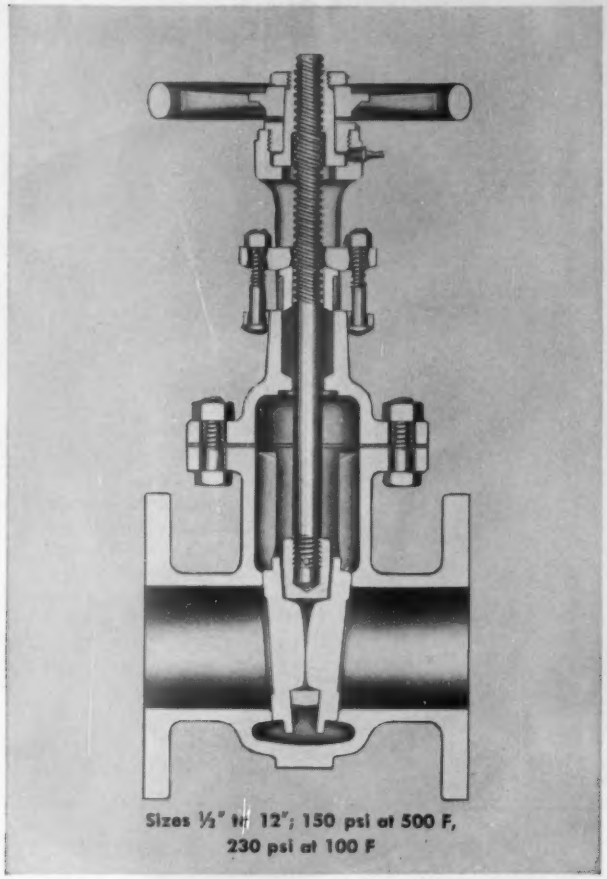
The proposed purchase is envisaged in the company's financial projections filed with its application to the National Energy Board for a gas export license. The projections anticipate the company will have a net income of $4,500,000 in the year ending October 31, 1961, and $8,300,000 in 1963.

Federal financing has been used exclusively to build the northern Ontario leg. Up to last January 31, the government had spent $112,750,000 in virtually completing that section, a 675-mile 30-in. line running from the Manitoba border.

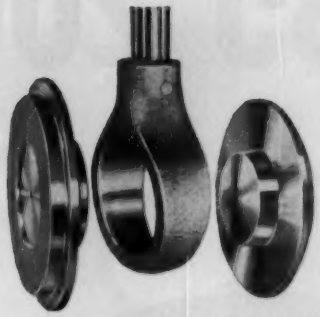
Originally, the Ontario government was to have put up one-third of the cost and lease the line to Trans-Canada. But last February the provincial government withdrew from the scheme because it wouldn't get enough interest on the investment.

Ontario's interest on financing of up to $35,000,000 was to have been the prevailing rate for Ontario bonds.

Although the lease of the north-Ontario section to Trans-Canada was based on a firm interest rate of 3½%, there had been no definite agreement about the rate on Ontario's share of construction costs.



Sizes ½" to 12"; 150 psi at 500 F, 230 psi at 100 F



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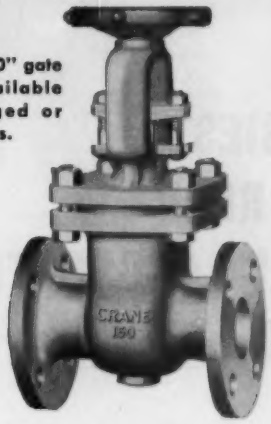

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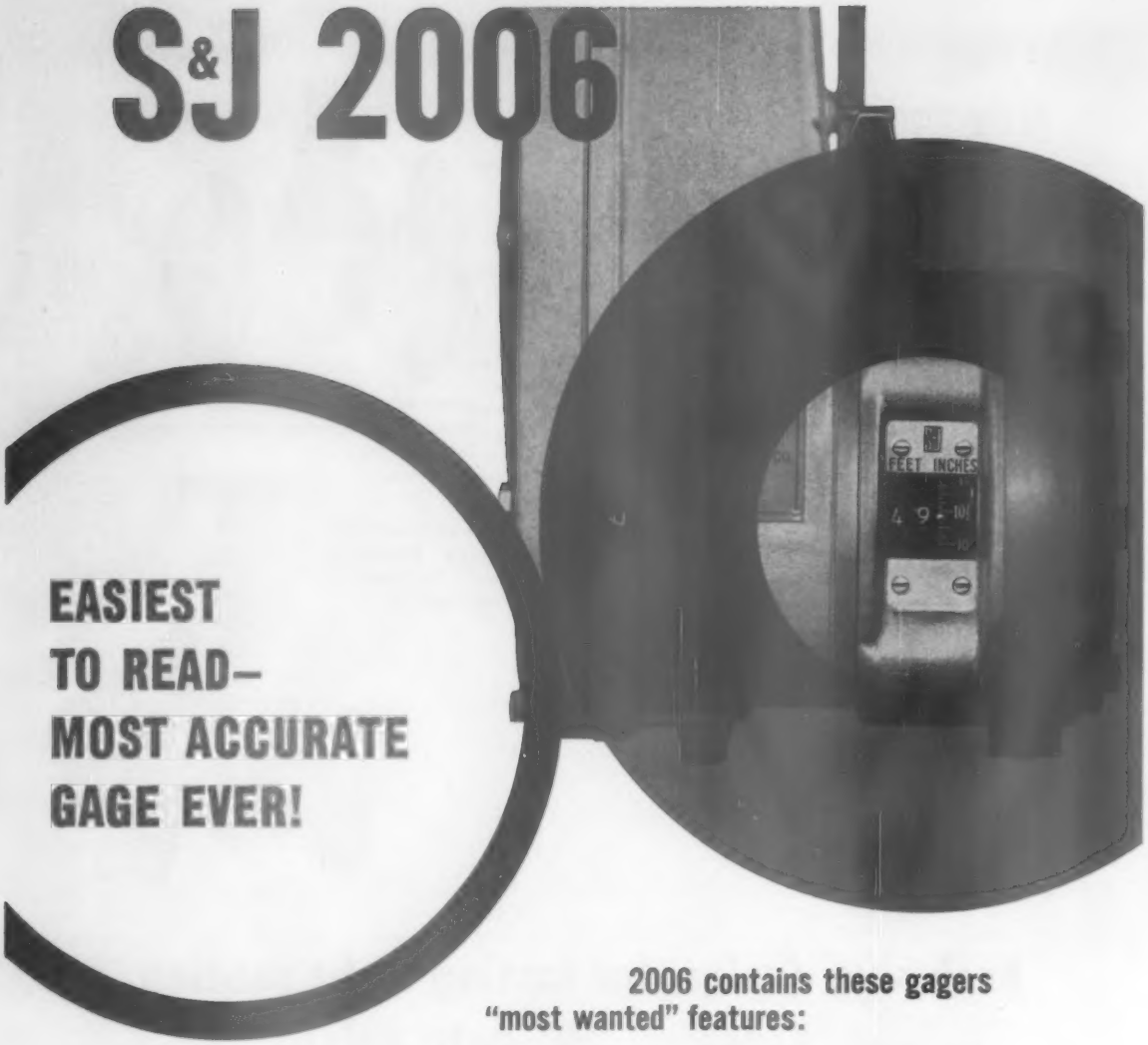

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Mississippi Coastal Counties Get First Oil

AN OIL discovery just inland from Bay St. Louis in Hancock County, Mississippi opens the second field and first oil production in the state's sparsely-explored coastal counties.

It is 16 miles northeast of the first field at Ansley, near the coast and the Louisiana line. Nearest other field is more than 40 miles north at Maxie and Pistol Ridge, in Forrest and Pearl River counties.

The discovery was brought in by Marshall R. Young, Brookhaven, Miss., independent operator, who also discovered Ansley field. The discovery well, 1 Jordanacres, flowed initially at the rate of 120 bbl. of 35°-gravity oil daily through 7/64-in. choke with pressure of 1,100 psi.

Completion is from the top foot of 11 net feet of oil sand logged at 10,286-96 ft. in the Dantzler member of the Lower Cretaceous Washita-Fredericksburg section. Hole was drilled to 10,349 ft.

Pay is the locally designated Cuevas sand, productive at Ansley of gas and condensate. Ansley, discovered in 1956, now has six wells. Pay there is at depths below 10,800 ft.

Both fields are on a major regional geological feature known as the South Mississippi uplift, or Wiggins Anticline, extending eastward - westward through the three coastal counties. The uplift marks the southern rim of the East Mississippi embayment, or salt basin, site of the state's main oil and gas exploration and development.

PIPELINE BRIEFS . . .

A double-jointing contract has been awarded to Bechtel Corp. by Engineers Limited Pipe Line Co. on a 76-mile 26-in. line being laid for Trunkline Gas Co. from Rosville, Ill., to Vistula, Ind. Work got under way last week. Other contracts have been announced by Trunkline for this project, which has been delayed by the steel strike.

The 121-mile 26-in. line planned by Consumers Power Co. in connection with the Trunkline project also was started last week after a delay caused by the steel strike. Cape Construction Co., Inc., has the contract.

A 60-mile 36-in. gas line in the Chicago area has been completed by Peoples Gas Light & Coke Co. and Chicago District Pipeline Co., a subsidiary. The line parallels two existing lines from Joliet to the Calumet station of Peoples. It links Peoples with lines of Texas Illinois Natural Gas Pipeline Co., another subsidiary, and with the new Midwestern Gas Transmission Co. line.

A contract for a 12-mile 20-in. gas line in the vicinity of Indianapolis, Ind., has been awarded to Somerville Construction Co. Work began last week on the project for Citizens Gas & Coke Utility.

Buckeye Pipe Line has completed its 115-mile, 20,000-bbl. products line from Wayne to Flint and Owosso, Mich. It will link these markets with the Aurora Gasoline and Mobil Oil refineries in Detroit and via Sun Pipe Line with the Sun refinery at Toledo.

Texas Eastern Transmission Corp. is making deliveries over an 8-mile extension of the Little Big Inch to the Blue Island area of Chicago. Deliveries of 10,000 bbl. daily are scheduled for the extension. Chicago is served by a 14-in. 240-mile lateral from the 20-in. main line at Seymour, Ind. Eleven Chicago area terminals are now served by the line, nine of which are along the Sanitary and Ship Canal.

Continental has completed a 157-mile 6-in. products pipeline from Artesia, N. M., to El Paso and will complete two products terminals at El Paso and Albuquerque this month.

The new pipeline will tie in at El Paso with Southern Pacific's products line to Tucson and Phoenix and with a Standard Pipe Line Co. line to Albuquerque.

Also for Pipeliners . . .

IN THE NEWS: Canada's Energy Board sets January meeting to hear gas-export requests (p. 75) . . . Trans-Canada will buy the government-owned Ontario leg of its big line (p. 86) . . . World's longest pipeline pull made in the Persian Gulf off Iran (p. 98) . . .

A complete list of pipeline projects is carried in the last issue of each month. Current projects are carried in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: Engine analyzer aids in engine tuneup (p. 110) . . . Synthetic diaphragms cut p.d.-meter maintenance (p. 146) . . . The economics of gas transmission (p. 148).

Jersey-Humble Deal Final—Almost

• The only sour note is a lawsuit filed by a Humble stockholder in an effort to block the consolidation. Merger articles are approved by Texas official, but case still must go to court in Austin before merger is final.

MERGER of Standard Oil Co. (N. J.) and Humble Oil & Refining Co. — approved overwhelmingly by stockholders of both companies—has bumped into a slight legal snag.

One of the few dissenting shareholders has gone into district court in Austin, Tex., in an effort to prevent the merger of Jersey Standard affiliates.

The lawsuit will not prevent the merger at this time because it doesn't seek a temporary restraining order. It does, however, seek a permanent injunction, and the case will be tried on its merits.

The case was filed last week a short time after shareholders of the two firms voted in favor of selling Humble's assets to the newly-incorporated Humble of Delaware and merging the old Texas-incorporated Humble into Jersey Standard. The merger articles were approved by the Texas secretary of state, despite the lawsuit.

JERSEY STANDARD'S two top men, President M. J. Rathbone, left, and Chairman Eugene Holman, right, directed the special stockholders meeting in New York. It was Holman's last stockholders meeting. He is scheduled to retire next spring.

The opposition . . . The plaintiff in the lawsuit is Jack Finkelstein, a Houston investment broker whose family is a charter stockholder of Humble. The family holds about 16,000 shares of Humble stock, valued at some $900,000 to $1,000,000.

Finkelstein alleges in his petition that the exchange of stock (five Jersey shares for four Humble shares) fails to compensate him adequately for his 2,000 Humble shares. He also maintains that the sale of Humble's assets deprives minority stockholders of "their interest in an operating and profitable concern."

The lawsuit further contends that the 1955 Business Corporation Act of Texas contains a clause that, properly construed, would make it necessary to gain unanimous approval of stockholders to approve the sale of assets in a corporation.

The act states that only a four-fifths majority is required but carries also the following clause: "Nothing contained in part 5 of this act shall ever be construed as affecting, nullifying or repealing the antitrust laws or as abridging any right or rights of a dissenting stockholder under existing laws."

James G. Cowen, attorney for Finkelstein, said he construes this clause as meaning that persons who owned stock prior to passage of the 1955 act can block any sale of assets or merger if they feel their rights are being abridged.

Cowen said that while the lawsuit does not seek to set aside the merger immediately, further legal action may be taken that could change this picture.

In any event, Texas Secretary of State Zollie Steakley approved the merger articles a few minutes after the filing of the lawsuit in the 126th District Court of Judge Jack Roberts.

Steakley took the position he was performing a ministerial duty and had no discretion in the matter.

Steakley is a defendant in the Finkelstein lawsuit along with directors of the Texas-incorporated Humble organization.

The votes . . . Jersey and Humble stockholders voted on the merger program at separate meetings.

In New York, approximately 600 Jersey shareholders, representing 81.6% of the outstanding stock, voted 183,738,091 shares for the merger—compared to only 504,278 against it.

In Houston, Humble stockholders also voted overwhelmingly for the merger proposal. Finkelstein was one of three dissenters at the meeting.

With Jersey itself owning 98.27% of Humble stock, shareholders who owned 99.49% favored selling Humble's assets to the new Delaware corporation. In terms of shares represented, the vote was 71,854,337 for the proposal and 98,612 against.

On the second proposition—merger of Humble of Texas with Jersey—the vote was 99.48% in favor.

New York meeting . . . The near unanimity of the vote in New York by Jersey stockholders was a reflection of the tone of that meeting.

Numerous stockholders praised the Jersey management. Only a few followed words of praise with some of criticism. One urged management to put more glamor into advertising.

Two points were made by several: They wanted the company to encourage more political activity and consciousness among the stockholders and employes, and they wanted to know the company's plans for a national trademark.

President M. J. Rathbone said that the company has several survey teams

working on a national trademark. Jersey affiliates now market in 37 states and plan to expand to all 50. At that time, he said, a nationally-accepted emblem would be most desirable. One solution would be to develop a new name that could be used in conjunction with existing names that have earned high consumer acceptance.

An emotional note was introduced into the meeting when a standing ovation was proposed for Chairman Eugene Holman. Holman is scheduled to retire next spring. This was the last stockholders' meeting at which he would preside.

Rathbone answered most of the stockholders' questions. Here are some of the points he made:

... **Jersey's earnings** for the first 10 months this year are 17.6% higher than in the same months of 1958. Better earnings are due entirely to increased volume of sales and improved efficiency of operation. Price realization, actually, was 4% lower in the first 9 months of 1959 than a year earlier.

... **Spending by Jersey** in the search for oil will be at least $400 million below the peak of $1.4 billion reached in 1957 and will probably remain at this lower level the next few years.

... **In the past** investment has been concentrated on long-term growth. "Now we can concentrate on projects which should assure more immediate profit, a policy we expect to continue into 1960 and for as long thereafter as seems desirable," Rathbone said.

... **By 1975** free-world oil consumption will be some 14 million barrels a day higher than in 1958.

... **The situation** in the Middle East is more favorable today than it has been in the recent past. "While we are not happy with developments in Venezuela, there seems to be an improved tempo there," Rathbone said.

... **When the Jersey** subsidiaries in this country are put together, this is what they will add up to:

Production, 440,900 bbl. per day; producing oil and gas wells, 19,200; refining capacity, 954,000 bbl. per day; service stations, 22,040; total assets (1958), $2,962,000,000; employes, 41,900; total operating revenue (1958), $2,616,000,000.

Esso elects ... Esso Standard Oil Co. met the day after the special Jersey meeting and elected C. V. Tracy to succeed William S. Naden as president. Naden has been made an executive vice president and director of the new Humble of Delaware.

Tracy has been a director of Esso since 1954, a vice president since 1956 and, from 1952 until 1958, president of Enjay Co., Inc., Esso's petrochemical marketing affiliate.

Tracy, a former general manager of Esso's chemical-products department, joined Esso in 1930. He graduated from the Naval Academy in 1924.

At the same time Robert V. Scholl was named executive vice president to succeed E. Duer Reeves, now a Humble vice president and director. Scholl joined Esso's law department in 1937, became associate general counsel in 1946, and general counsel in 1949. He was elected a director and vice president in 1949.

Holman Sees Bigger Markets for Oil

THE MOTIVE behind the Jersey-Humble merger is to place the organization "in a better competitive position nationally," Eugene Holman, chairman of Standard Oil Co. (N. J.), told a Houston Chamber of Commerce audience last week.

"Forecasts that present consumption of energy in the United States will double by the early 1980's, and that oil and gas will be called upon to satisfy a major part of this demand, give promise of a new era for our industry," he said. "Our motive in creating a new corporate instrument has been to put ourserves in a better competitive position nationally to meet this exciting future," Holman declared.

The Jersey chairman also put in a good word for oil imports.

He said that cutting imports is a "short-term solution" to economic problems and that the major interest of the U. S. lies in keeping a high level of world trade.

"All of us believe in competition," he said. "Competition, both nationally and internationally, results in occasional stresses, but we cannot have our cake and eat it, too. We cannot have the benefits of free competition without the stresses and strains that go with it. And that is true both in respect to the national and international market."

PROCESSING BRIEFS ...

A 25,000 M.c.f. per day natural-gasoline plant will be built by Ohio Oil Co. in the Scipio, Pulaski, and Albion fields of south central Michigan. Using absorption-refrigeration and sweetening the plant will initially produce 40,000 gal. daily of propane and a mixture of butane and natural gasoline. Stearns-Roger Mfg. Co. will construct the plant.

An ethylene plant, with an annual capacity near 200-million pounds, will be built by SunOlin Chemical Corp. at North Claymont, Del. The plant will cost about $15-million. Feed stock will come from Sun Oil Co.'s, Marcus Hook, Pa., refinery. Part of ethylene oxide and glycol. SunOlin's the ethylene will be used to make ethylene and Sun's propylene will be the only large source for both these olefins on the East Coast. SunOlin's $8-million urea plant will be completed early next year. (OGJ, Nov. 23, 1959, p. 92).

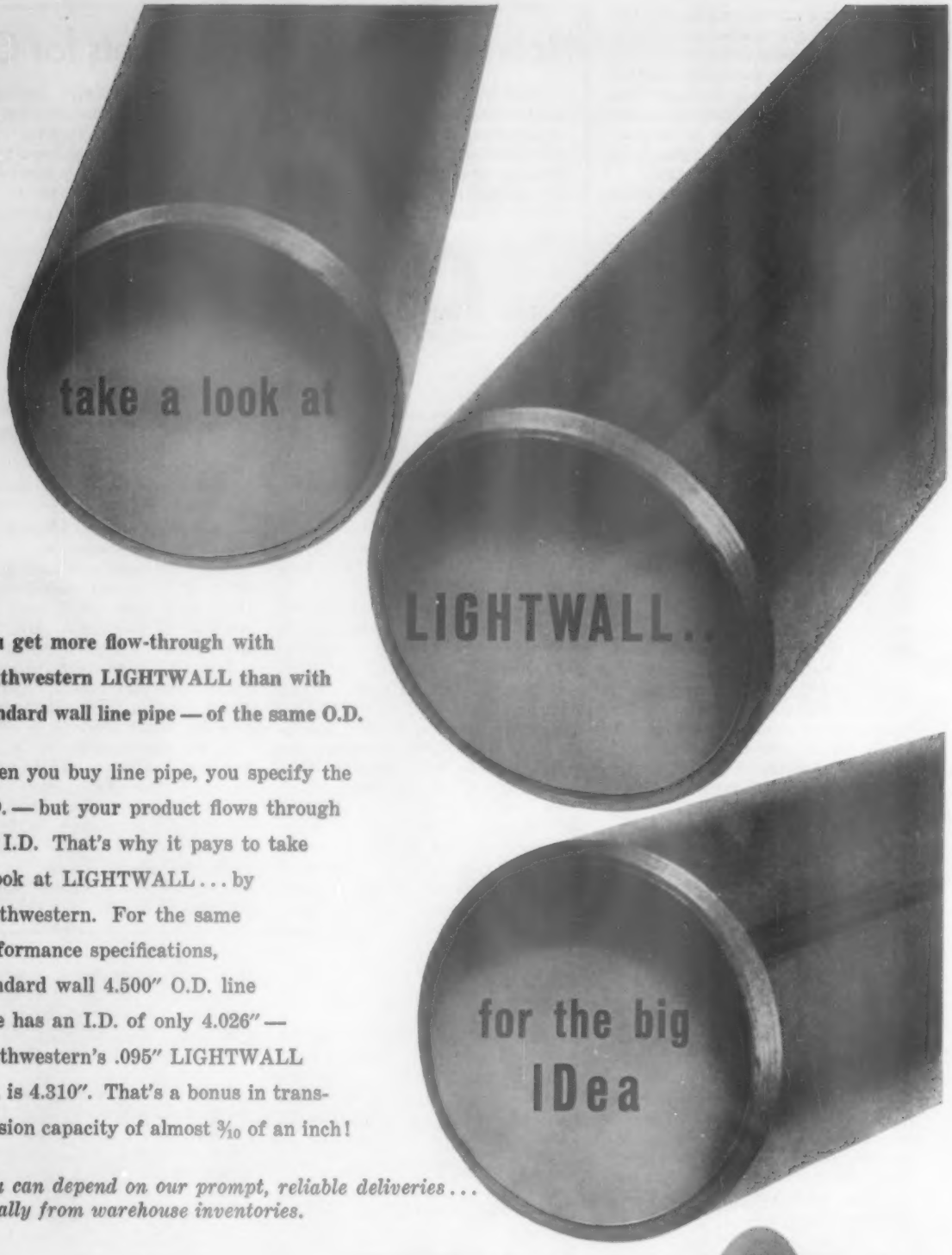
A CO boiler, gasoline blending facilities, and offsite expansion costing about $4-million will be built at Union Oil's Wilmington, Calif., refinery by Fluor Corp. The CO boiler will substantially reduce air pollution by incinerating fluid catalytic cracking unit flue gas to produce steam.

New asphalt-blending and loading facilities will enable Shell Oil Co. to start serving East Coast markets from its Norco, La., refinery next spring. Shell's present asphalt output at Norco is sold in local markets or moved by tank truck or tank car.

Also for Refiners ...

IN THE NEWS: Octane race appears to be stalled this year, but it may resume in 1961 (p. 80) ... Survey shows trading stamps fail to boost gasoline sales (p. 83) ... Isolated price cuts jar U. S. crude market (p. 86) ...

PLUS THESE TECHNICAL REPORTS: How to select refinery and petrochemical drivers (p. 113) ... Steel-jacketed plastic pipe solves corrosion problems (p. 132) ... Deethanizer utilizes propane sidestream (p. 135).



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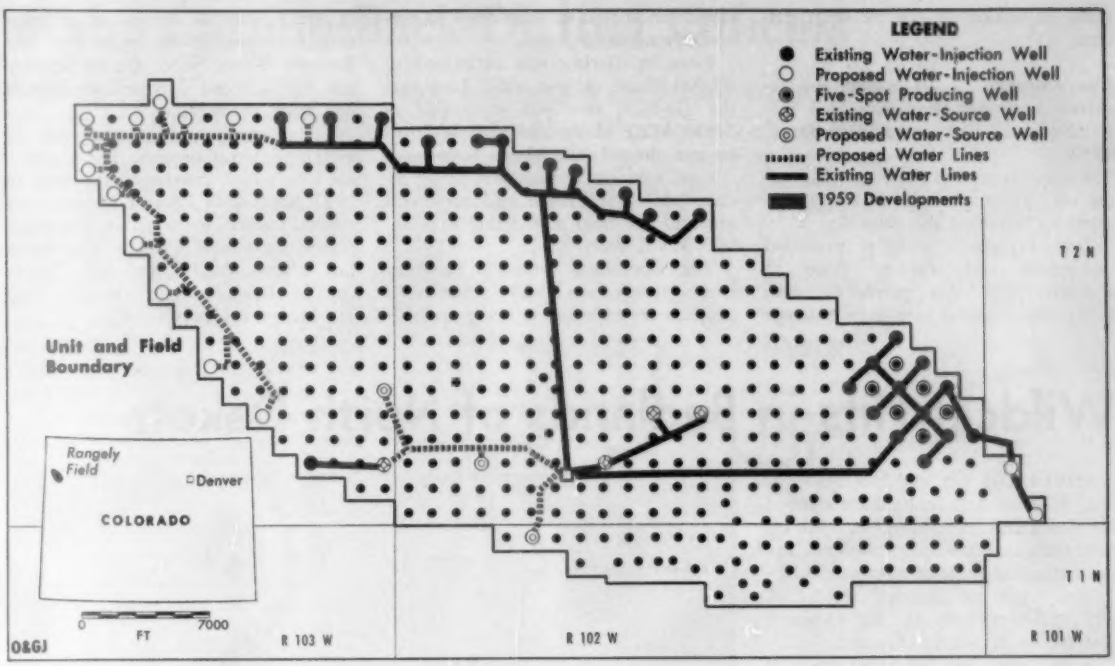


There's a long way to go, but

Rangely flood moving in high gear

THE TIMETABLE for water injections in the expanding Rangely field flood reads like this:

. . . **25,000 bbl. daily** since last February when operators started the injection.

. . . **60,000 bbl. daily** by next March —the easily realized intermediate goal.

. . . **160,000 bbl. daily** as ultimate injection goal.

The California Co., as operator, is moving ahead steadily in its program to ring the 19,120-acre Colorado field with water-injection wells to flood the Weber sand at 6,400 ft. But as the timetable suggests, there is still a long way to go.

Operations . . . Converting wells to water input is progressing smoothly.

The first step was to convert 10 wells on the northern flank and 10 wells on the east flank (OGJ, Nov. 3, 1958, p. 50). The northern flank was designed for a peripheral flood while the east flank was tentatively set up on a five-spot pattern. Water input started in both areas last February.

Since then 10 more wells have been converted on the northwest and west flanks, and three more source wells prepared. Initially, the water system consisted of three source wells, a central pump station with 40,000-bbl. daily capacity but designed for expansion to 160,000 bbl., and 12-in., 8-in., and 3-in. lines to the injection wells.

Ultimately, additional input wells and water-distribution lines will touch all flanks of the structure.

Operating problems . . . So far, the project has been relatively free of major problems.

California Co. engineers, who are directing the project, report none of the usual difficulties. For example:

. . . **Corrosion** is being held to a minimum. The injection water and the produced oil seem to offer no problems of corrosion.

However, no chances are being taken on this score. Sampling coupons are being taken throughout the field so that any changes in the corrosion experience will be detected immediately. So far there has been no cause for alarm.

. . . **A minimum of water treatment** also is required. The Entrada and Navajo formations yield water which is produced through a closed system in order to keep out oxygen.

Consequently, only a small amount of Calgon is required to retard deposition.

Profiling tests of all known methods have been used in the injection wells to determine where the water is going. Data collected by California Co. engineers are being used to evaluate the various tools and techniques, but no decisions have been reached on standardization of equipment.

. . . **Bacteria offer no problem.** In fact, no serious bacterial action has been detected so far. Engineers still are keeping a close check on the system for this, too. As the volume of produced Weber water added to the total stream increases, bacteria could become a problem.

The well program . . . Converting oil wells on the periphery of the field to water-injection wells is proceeding on schedule. So far the injection wells are being completed with open-ended tubing to the lower part of the Weber formation.

The wells are deepened in order to expose as much sand as is found in the second line-offset well.

This may not be feasible on the south and southwest flanks of the structure because the formation dips sharply. The wells in these areas will be handled differently.

On the eastern flank there may be

some expansion of the five-spot pattern.

Gas program . . . Gas-handling facilities have not been increased materially since unitization, October 1, 1957.

Engineers report, however, that better use is being made of the equipment by rerouting the gas.

Gas injection actually preceded unitization and water flood at Rangely. The gas produced with crude was injected in a dispersal-type operation at first in an attempt to prevent tremendous waste.

Loss by flaring was estimated at 45,000 M.c.f. daily in 1957. Last year the gas-flare rate was controlled at 5,600 M.c.f. daily and now is down to less than 2,000 M.c.f. daily.

Gas injection currently is being directed into the crestal and northwest areas of the field at the rate of 110,000 M.c.f. daily.

The combined primary recovery and gas-injection and water-flood projects are expected to bring up 50% of the 1.5 billion barrels of oil estimated originally in place in the Rangely Weber Sand. Up to September 1959, about 275 million barrels had been produced.

The Rangely unit started with 45 working-interest owners. The California Co., which discovered the field in 1932, holds 46% interest. Other major interest owners include Pan American Petroleum Corp., Phillips Petroleum Co., Union Pacific Railroad, Equity Oil Co., Utah Southern Oil Co., Texaco Inc., and Husky Oil Co.

Wildcat Hits in Badlands of North Dakota

SHELL OIL Co. and Northern Pacific Railway apparently have opened up North Dakota's seventy-seventh oil field with a rank wildcat in one of the most desolate parts of the state.

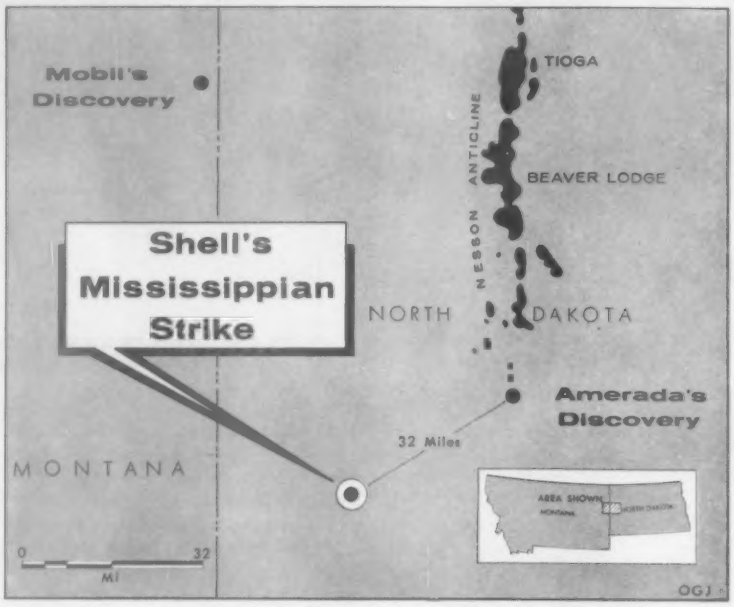
The well is the Shell-NP 32-15 (SW NE 15-145n-101w) in the badlands country of McKenzie County.

A drill-stem test indicated the well would be a commercial producer. The 2¼-hour test yielded 8,149 ft. of oil and 1,170 ft. of salt water from the Mission Canyon formation at 9,319 to 9,418 ft. It is the first Mission Canyon oil in this section of the basin.

Total depth of the wildcat is 9,535 ft. Casing is being set, and production will follow soon. The first drill-stem test recovered a small amount of oil from 9,184 to 9,215 ft.

The well is farther from production than any other North Dakota discovery well in recent years. It is about 35 miles north of Scoria field in Billings County and about 35 miles southwest of southernmost production on the Nesson anticline.

While geologists say the drill-stem test indicates a producer better than many on the anticline, the Shell strike has no geological connection with the anticline. The well is the third in a series of three Shell-NP ventures that started in the summer of 1958 in western North Dakota. The first two were dry.



Other developments . . . Exploration in the Williston basin also has been highlighted by two other remote discoveries.

An Amerada Petroleum Corp. well was brought in at the south end of the Nesson anticline as the first producer in Dunn County. The wildcat flowed 313 bbl. of oil daily on 10/64-in. choke from perforations at 11,538-72 ft. in Duperow-Devonian rocks.

Mobil Oil Co. is preparing a drill-stem test at its discovery, F-44-20-P Mueller, in the Dwyer area of Sheridan County, Montana. The wildcat earlier tested shows in Bakken Mississippian below 9,000 ft. and in the Mission Canyon at 8,000-8,162 ft.

Union Gets Second Good Gas Well on Kenai

UNION OIL CO. of California has successfully tested a second gas well drilled on the 61,468-acre Kenai Unit on Alaska's Kenai Peninsula.

Although no figures were released, the well depth was reported at 5,809 ft. The discovery well, 1 Union-Ohio, found production of around 10,000 M.c.f. daily in an interval between 3,000-4,000 ft. The new well, 34-31 Union-Ohio, is about 1 mile northeast of the discovery.

Gas from the field is slated for delivery to Anchorage area customers, 65 miles northeast of the field, by late 1961. (OGJ, Oct. 19, p. 98).

On the Swanson River Unit 23 miles northeast of the Union-Ohio Oil Co. activity, Standard Oil Co. of California is testing for oil in a well which has already given strong indications of being a commercial gas discovery if the oil test doesn't pan out.

This well is 12-27 Swanson River Unit located about 2½ miles south of the Swanson River Unit discovery. Standard reported the well had a successful gas test in a zone at 7,600 ft. on the way to its present depth of 11,500 ft. in the Hemlock.

Mobil Cutting Back District Offices

MOBIL OIL Co. will reduce its exploration and production offices east of the Rockies from 46 to 16 in the company-wide reorganization move now under way.

Under the new setup, division offices will be located in Houston, Midland, Denver, and Los Angeles. The present readjustment applies to the first three. Changes in the Los Angeles district will be disclosed after January 1 when General Petroleum, the West Coast affiliate, becomes a part of Mobil Oil.

The Houston division will have district production and exploration offices in Corpus Christi and Shreveport, district production offices in Victoria, Tex., and Lafayette, La., and district exploration offices in Jackson, Miss., New Orleans, and Houston.

The Denver division will have district production and exploration offices in Oklahoma City, Wichita, Kans., and Casper, Wyo., and a district exploration office in Pittsburgh, Pa.

The Midland division will have district production and exploration offices in Midland and Wichita Falls, Tex., district production offices in Lubbock, Tex., and Hobbs, N. M., and a district exploration office in Roswell, N. M.

The Houston division, headed by Henry L. Waszkowski, vice president, covers the Gulf Coast and East Texas, Arkansas, Louisiana, Tennessee, Mississippi, Alabama, Georgia, North and South Carolina, and Florida.

The Denver division, headed by E. V. Watts, vice president, covers eastern Colorado, Montana, Wyoming, Oklahoma, and all midwestern and northeastern states.

The Midland division, under R. D. Hanley, vice president, includes Texas, except the Gulf Coast and East Texas, and all of New Mexico, except for the San Juan Basin.

Montana Widens Its Spacing

. . . by amending rules to provide for 40-acre spacing in place of 20 acres. Most companies agree with commission.

THE INDUSTRY'S drive for wider well spacing has made some more headway.

The Montana Oil and Gas Conservation Commission has amended its rules to provide for basic 40-acre spacing in place of its previous 20-acre pattern.

The commission acted following a statewide hearing in Helena. It had proposed 40-acre spacing, but it left the door open for other patterns if the evidence supported them.

Industry sentiment was largely in favor of the commission's plan. The change to 40 acres was supported by The California Co., Union Oil Co. of California, Phillips Petroleum Co., Continental Oil Co., Carter Oil Co., Amerada Petroleum Corp., Hunt Oil Co., Placid Oil Co., and Honolulu Oil Corp.

A group headed by Shell Oil Co. and including Mobil Oil Co. and Gulf Oil Corp. backed a plan calling for 40 acres below 3,500 ft. and roughly 10 acres for shallower fields.

Sinclair Oil Corp., backed by Northern Pacific, submitted a "step-depth" proposal for 40 acres from 3,500 to 5,000 ft., 80 acres between 5,000 and 10,000 ft., and 160 acres below 10,000 ft.

Only major company arguing for wide spacing across the board was Atlantic Refining Co., which pushed for a 160-acre basic spacing pattern. The Atlantic plan would have required 160-acre spacing in all fields in the early stage of development.

If reservoir information gathered during this stage should show the need for narrower spacing, a change could be made following hearing.

Marked improvement . . . Even those companies favoring wider spacing, however, are pretty well satisfied with the new 40-acre rule.

For one thing, they feel, it is so written to eliminate clustering of wells around lease corners and generally nonuniform development.

The old rule called for wells to be located no closer than 330 ft. to the lease line and no less than 990 ft. apart. But this applied only to wells on "the same lease."

Inclusion of this phrase not only fostered well clustering around common lease corners but also resulted in inequities between large and small leases. An operator with only a 40-acre lease could drill only one well, while one with an 80-acre lease could drill as many as three, and a 160-acre lease could legally support nine wells.

The new rule, calling for 330 ft. from the lease line and 1,320 ft. between wells, eliminates the phrase "on the same lease." Spacing within a field thus will be much more uniform. The first 40-acre well drilled in a field will set the relative spacing arrangement for wells to follow.

World Output Rises

- **Russia takes No. 2 producing spot from Venezuela. U. S., Canada register small gains.**

FREE-WORLD crude production rose slightly in September, but output still was only slightly above the level of a year ago.

In the Western Hemisphere, United States output rose 91,000 bbl. daily, and Canadian, about 38,700 bbl. daily. Venezuelan production virtually stood still.

Iran reached a milestone by passing the 1-million-barrel-daily level for the first time since the initial Middle East discovery was made there 51 years ago. The record shows the comeback the country has made since its wells were reopened in 1954 after nationalization.

Russia is edging out Venezuela as the world's second ranking producing country. Venezuela has more capacity, but Soviet output of 2,688,000 bbl. daily during the third quarter was a higher output.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total free-world outside U. S.
1958			
September	3,761.2	4,545.7	9,125.7
October	3,891.3	4,482.3	9,177.5
November	4,037.8	4,472.1	9,309.5
December	4,119.9	4,446.2	9,371.4
1959			
January	4,311.6	4,369.3	9,449.5
February	4,453.9	4,426.1	9,649.7
March	4,220.6	4,634.2	9,680.7
April	3,910.4	4,646.4	9,396.5
May	3,773.6	4,571.4	9,181.0
June	4,111.5	4,467.9	9,428.7
July	3,914.8	4,532.5	9,293.3
August	3,862.1	4,659.7	9,344.9
September	3,892.3	4,634.8	9,398.4

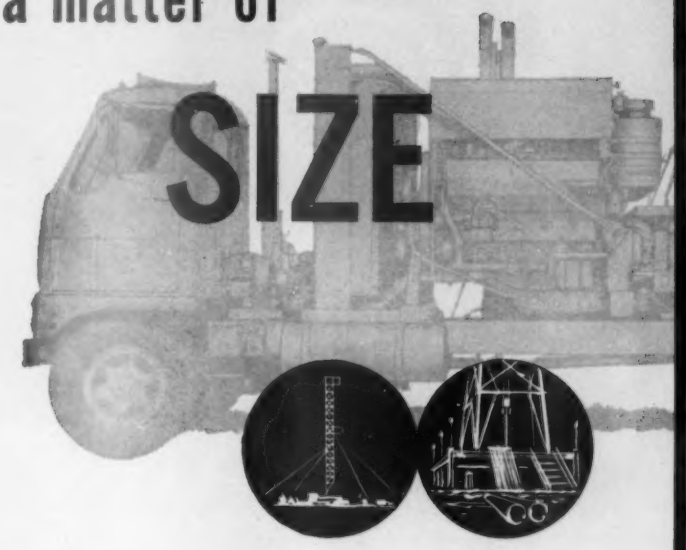
World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	Sept. 1959	Aug. 1959	Sept. 1958
Western Hemisphere			
Argentina	122.4	124.7	95.8
Bolivia	8.9	9.1	9.5
Brazil	75.0	75.0	57.4
Canada	548.7	510.0	437.7
Chile	18.5	18.1	15.5
Colombia	148.9	155.8	131.6
Cuba	0.6	0.6	0.9
Ecuador	7.6	7.6	8.1
Mexico	264.9	264.9	265.5
Peru	48.6	48.6	51.9
Trinidad	114.6	114.2	104.2
Venezuela	2,533.6	2,533.5	2,583.1
Total	3,892.3	3,862.1	3,761.2
Europe			
Austria	45.0	45.0	52.3
France	33.9	33.4	27.8
West Germany	100.4	100.4	88.9
Italy	30.6	34.7	33.6
Netherlands	33.7	33.9	31.0
United Kingdom	1.7	1.7	1.6
Yugoslavia	11.9	11.6	9.2
Total	257.2	260.7	244.4
Middle East			
Bahrain	45.2	45.2	43.3
Iran*	1,011.0	889.0	909.0
Iraq†	915.8	898.3	800.5
Israel	2.0	2.0	2.0
Kuwait	1,298.3	1,431.5	1,442.0
Neutral Zone	118.6	118.6	88.2
Qatar	181.1	171.5	174.0
Saudi Arabia	1,055.8	1,096.6	1,080.0
Turkey	7.0	7.0	6.7
Total	4,634.8	4,659.7	4,545.7

Country—	Sept. 1959	Aug. 1959	Sept. 1958
Other Asia			
British Borneo	107.0	107.0	109.6
Burma	10.5	10.5	9.0
India	8.5	8.5	8.5
Indonesia	355.0	330.0	331.1
Japan	7.7	7.7	7.3
New Guinea	4.4	4.4	5.4
Pakistan	5.9	5.9	6.0
Total	499.0	474.0	476.9
Africa			
Algeria	21.3	18.6	11.6
Angola	2.0	2.0	1.0
Egypt	62.2	38.4	65.3
Gabon	15.8	15.6	11.6
Morocco	1.8	1.8	1.4
Nigeria	12.0	12.0	6.6
Total	115.1	88.4	97.5
Free World			
Foreign	9,398.4	9,344.9	9,125.7
United States	6,857.0	6,766.0	7,099.0
Total	16,255.4	16,110.9	16,224.7
Communist Countries in Soviet Orbit			
Romania	235.0	235.0	227.0
Russia	2,688.0	2,688.0	2,260.0
Others	60.0	60.0	60.0
Total	2,983.0	2,983.0	2,547.0
WORLD TOTAL	**19,238.4**	**19,093.9**	**18,771.7**

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking. *Includes estimated 6,000 bbl. daily this year and 5,000 bbl. daily last year from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,300 bbl. daily from Naft Khaneh field, operated by Iraq Government.

It's not just a matter of SIZE



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Halliburton fracturing equipment is designed to handle all types of treating fluids, proportion additives into the fracturing medium and to perform under difficult pumping conditions.

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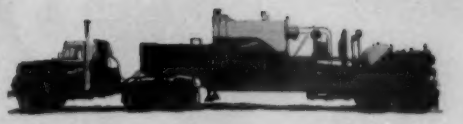


TWIN T-10 FRACTURING TRAILER

MODEL 45 SAND PROPORTIONER

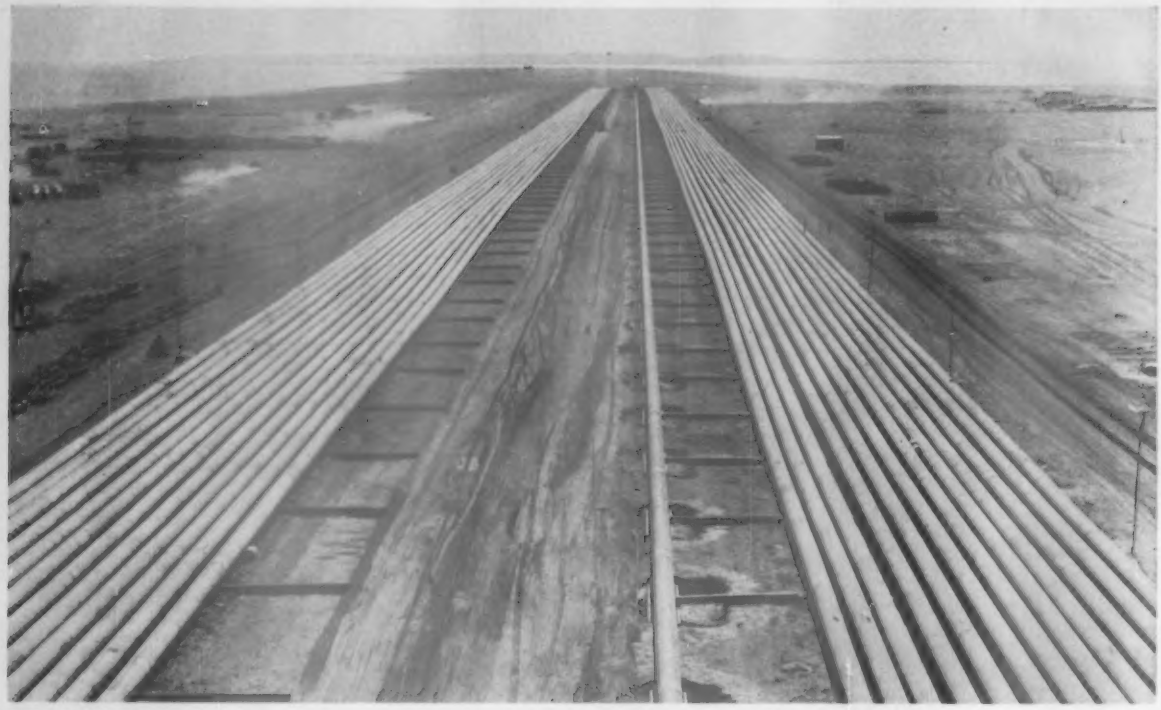
TWIN HT-400 FRACTURING TRAILER

MODEL 70 SAND PROPORTIONER

TWIN T-10 FRACTURING TRUCK

TWIN HT-400 FRACTURING TRUCK

MODEL 25 SAND PROPORTIONER



CONCRETE-COATED pipe is welded into 4,000-ft. sections to begin 19-mile pull in Persian Gulf.

World's Longest Pipeline Pull Made

A PIPELINE construction crew has just completed the longest pipeline pull in history—a 19-mile job done in the choppy waters of the Persian Gulf off Iran.

The big job involved laying a 30-in. pipeline on the floor of the gulf from Khargu Island to the Iranian mainland. The line is part of the offshore portion of a 99-mile 30-in. crude line which will move crude from Iran's Gach Saran field to Kharg Island (OGJ, Oct. 26, p. 66).

As a warm-up to the record pipeline pull, crews of International Marine Constructors, C. A., (Inmarco) made a 3-mile pull in laying an underwater line from Kharg Island to Khargu Island. This job was completed in mid-October. Both jobs were supervised by S. V. (Sammy) Collins, president of Inmarco and of Collins Construction Co., the parent firm.

A year's planning went into the project before a foot of line was laid. Inmarco engineers elected to use the continuous pull or "friction transposition" method of laying the line when it was decided neither the flotation nor the lay-barge method of submarine pipelining could be used.

The depth of the water—it is as deep as 160 ft. in spots—wave action and tidal activity forced the Inmarco crews to pull the line across the open stretch of sea.

For the big pull from Khargu to Ganeveh on the Iranian coast, the 8-meter lengths of 30-in. pipe were welded into 4,000-ft. sections. For the shorter pull, the line was welded into 4,400-ft. sections.

The pipe was doped, glass wrapped, and coated with 2½ in. of concrete. The strings of coated pipe cured and hardened before being laid.

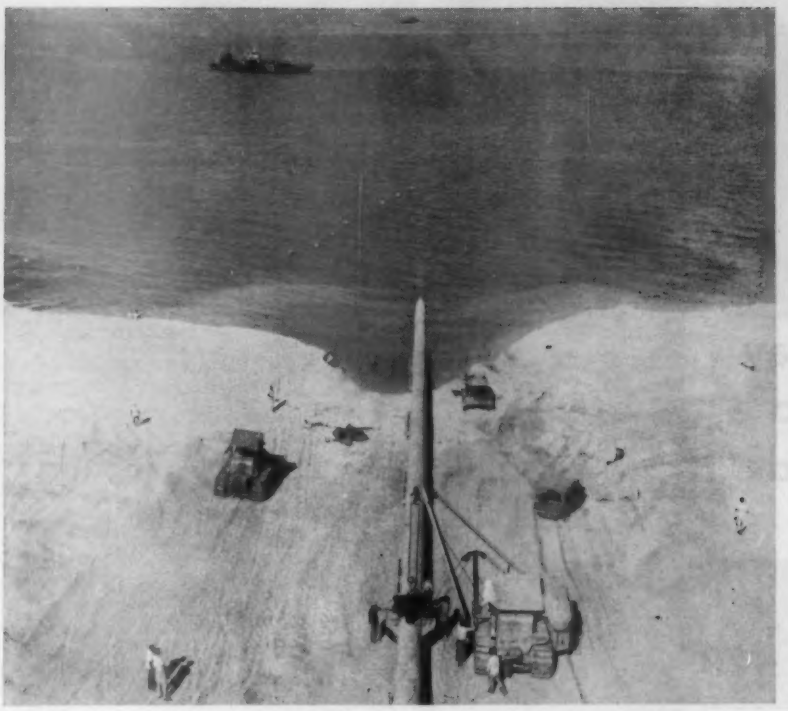
Strings were rolled on a series of rubber trailers 40 ft. apart at a launchway on Khargu Island, focal point of the operation. As the pipe entered the water, a bouyant pulling block was attached. As the pulling barge, which was guided by previously laid anchor lines, pulled a string into the water, another was welded on.

A holdback clamp and block connected to a winch on Khargu controlled the forward pull of the barge. The barge moved forward after each string was pulled. It anchored, then pulled a succeeding string. The barge was also connected to the mainland by cable. This helped guide the barge and helped hold it in place during the pull.

It took about 8 hours to complete the pull of one of the 4,000-ft. sections of pipe.

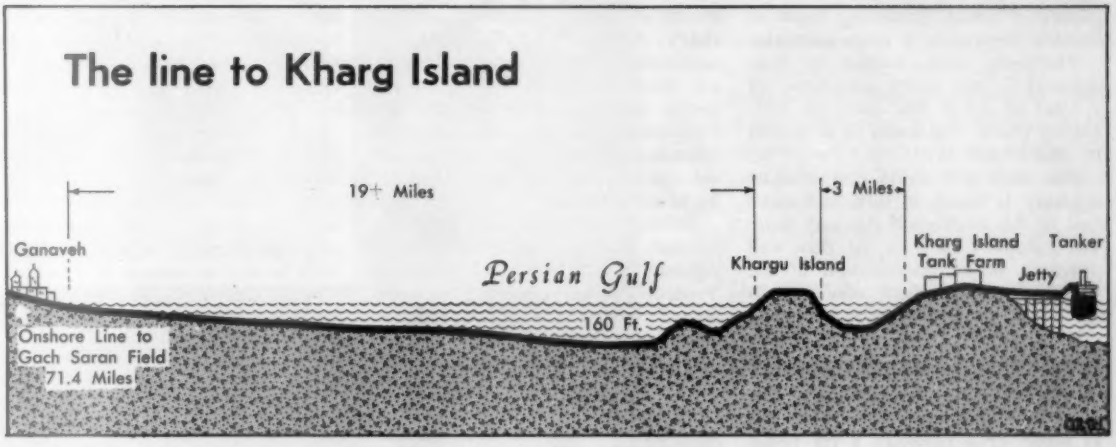
The whole system . . . After reaching the Iranian coast, the line runs inland about 71 miles to Gach Saran field, which Iranian Oil Exploration & Producing Co. is beginning to develop.

The line will deliver up to 350,000 bbl. of crude



PIPE ENTERS the water to begin trip from Khargu Island to Iranian mainland.

in Persian Gulf Off Iran

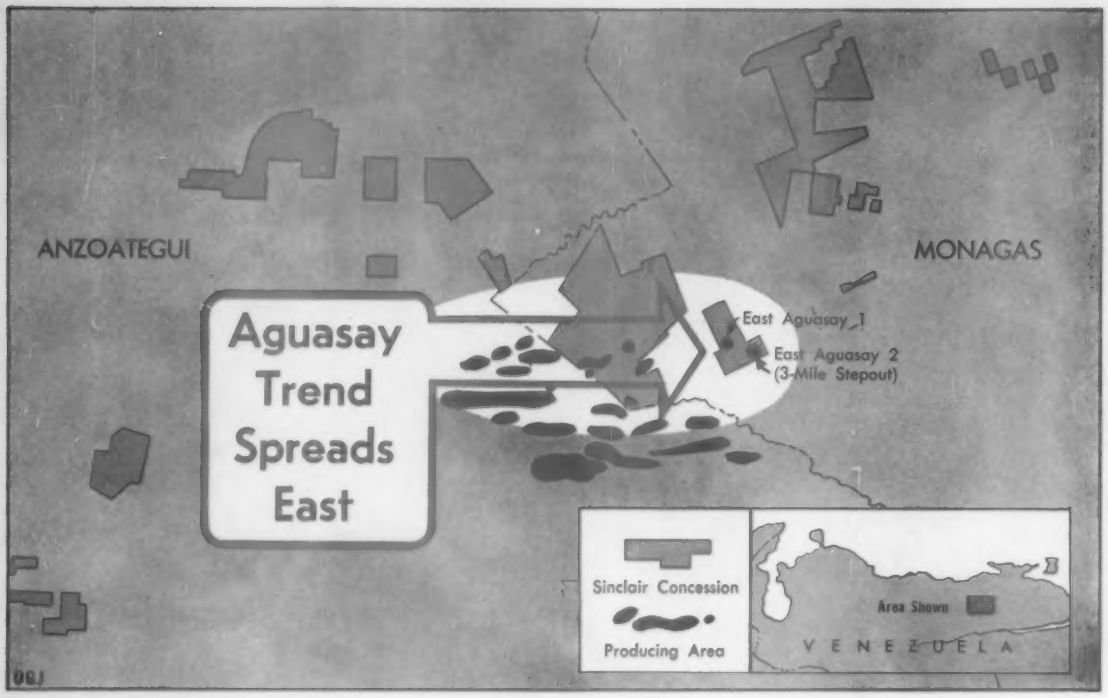


daily from the 30-year-old field. (OGJ, Oct. 12, p. 104).

The 30-in. diameter of the line makes it the largest gravity-fed pipeline in the world. And on Kharg Island, a terminal that will handle the biggest tankers built or projected will handle the Gach Saran crude.

Building the overland portion of the line is considered routine. It crosses both mountains and desert, but the problems encountered are relatively simple when compared with those involved in laying the line across the 19-mile stretch of open water to Ganeveh.

Gach Saran was discovered in 1928. It had only four producing wells, but these wells produce enough to fill a 12-in. line connecting the field with the Abadan refinery. Due to the small pipeline outlet, production in the field has been restricted to about 57,000 bbl. daily. But once the new system to Kharg island is completed, the production will increase to several times the present output.



Sinclair Extends Eastern Venezuelan Trend

• Completion of 3-mile stepout pushes Aguasay producing trend across 10 miles of Sinclair concessions in State of Monagas.

A SUCCESSFUL wildcat drilled by Sinclair Venezuelan Oil Co. has pushed a young producing trend in Eastern Venezuela 3 miles eastward.

The new well, known as East Aguasay 2, was dually completed for a total of 1,352 bbl. daily of 30°-gravity crude. The zones lie at 14,183 ft. and 14,264 ft.

The well is 3 miles east of East Aguasay 1, which, in turn, is 8 miles east of the established Aguasay field. The company believes the new well proves a major continuation of the producing trend, which now extends over 10 miles of Sinclair concessions. The trend itself is much longer. It covers an 8-mile stretch between Sinclair's Aguasay and East Aguasay concessions. The blocks in between are held by Creole Petroleum and jointly by Venezuelan Atlantic and Pancoastal Petroleum. The same trend extends miles to the west of Sinclair's acreage on properties being developed by Mene Grande.

Drilling on the east-west trend was sparked 3 years ago by Sinclair's Aguasay 3, which came in as Eastern Venezuela's best discovery in years. The company speeded development and is now producing 6,000 bbl. daily. But it has produced as much as 12,000 to 13,000 bbl. daily. Atlantic and Pancoastal have been producing 3,300 bbl. daily, and Mene Grande 1,600 bbl. daily from the same trend.

Sinclair's Aguasay 13 is being completed as a producer. No. 14 is drilling ahead. Next year the company plans to start reinjecting raw gas back into formation as a conservation measure. The East Aguasay wells will both be shut in because of a lack of a pipeline outlet.

Drilling Resumed Off Neutral Zone

AFTER being shut down 4 months as result of a blowout, a rig began turning to the right again last week on a Japanese company's wildcat off the Neutral Zone.

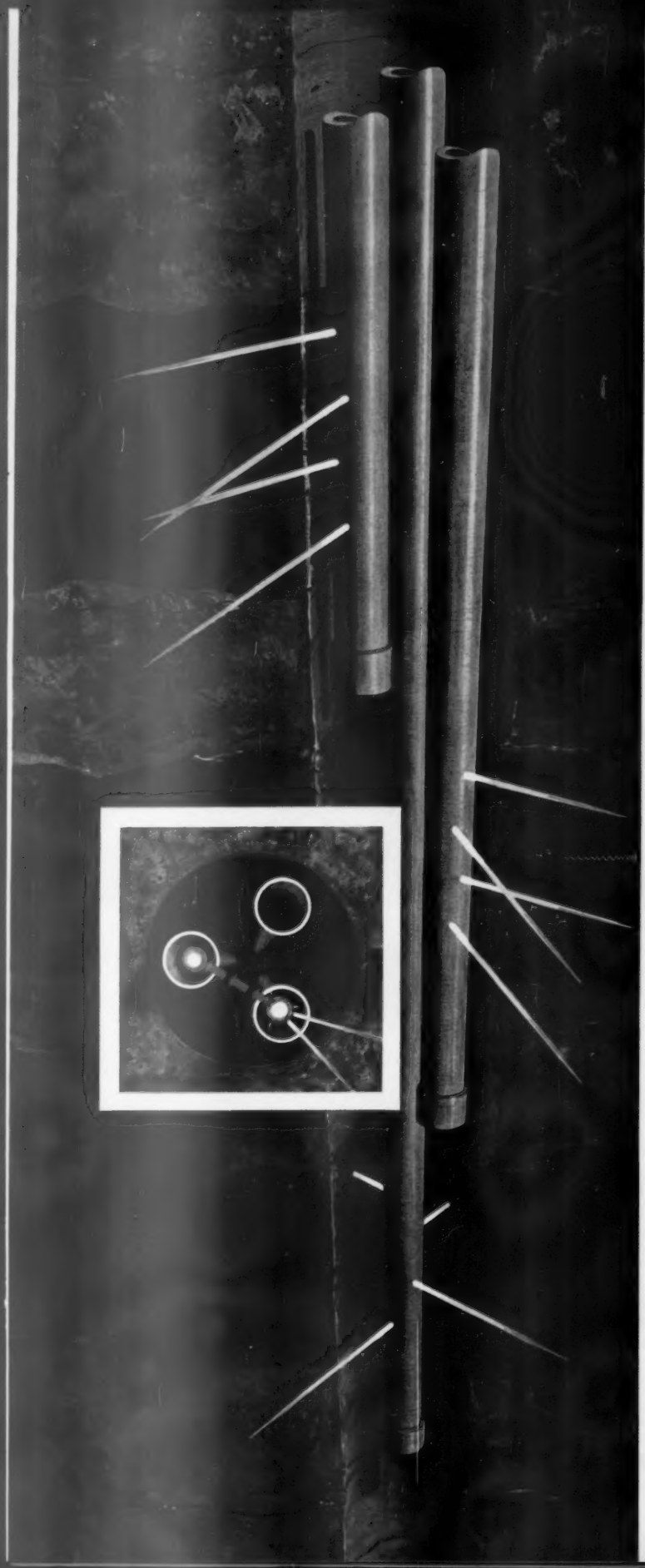
First reports from the well, which is 25 miles out in the Persian Gulf, gave no indication of trouble as the hole was re-entered. The test blew out July 19 after hitting a high-pressure gas pocket at 1,500 ft. The well blew wild for 9 days, destroying much of the drilling equipment.

The wildcat is the first test of an offshore concession held by Arabian Oil Co., a Japanese firm.

The test is scheduled to go to 8,000 ft. However, it may not go this deep if commercial production is found at a shallower depth. The Japanese are eager to establish production on the concession and have announced some extensive plans for developing a field once commercial production is assured. During the blowout, there was a strong flow of gas and an oil slick developed on the water around the rig.

International Drilling Co. of Rome is contractor for the well. The test is being drilled from a LeTourneau-type platform, the C. E. Thornton, owned by Reading & Bates Offshore Drilling Co. The platform was slightly damaged by the blowout, but most of the damage was confined to the rig and auxiliary drilling equipment.

Due to the remoteness of the location, a tender is being used to hold supplies for the platform. The tender may be converted to a drilling ship for some of the development drilling envisioned by the Japanese.



Oriented Perforating by Schlumberger . . . an Exclusive Development for New Multiple Casing Completions

Three oil wells in a single borehole . . . here is a modern completion method that reduces capital investment and lowers costs of oil production. *Schlumberger Oriented Perforating* is the modern perforating method that makes this progress possible.

The use of slim 2⅞" casings—cemented side by side in the same borehole to effect dual or triple completions—requires a perforating device that directs the shots to avoid penetration of adjacent casings. Schlumberger engineers have designed such a device that "sees" these adjacent casings and, at the same time, allows the operator to turn the aligned shaped charges into an unobstructed path. The result—each casing is efficiently perforated to form an independently producing well.

Schlumberger Oriented Perforating makes use of the Scallop Gun, another Schlumberger development for slim-casing completions. The Scallop Gun, a 2" O.D., steel-carrier, shaped-charge perforator, is designed to leave no debris to bridge the small-diameter pipe and interfere with production.

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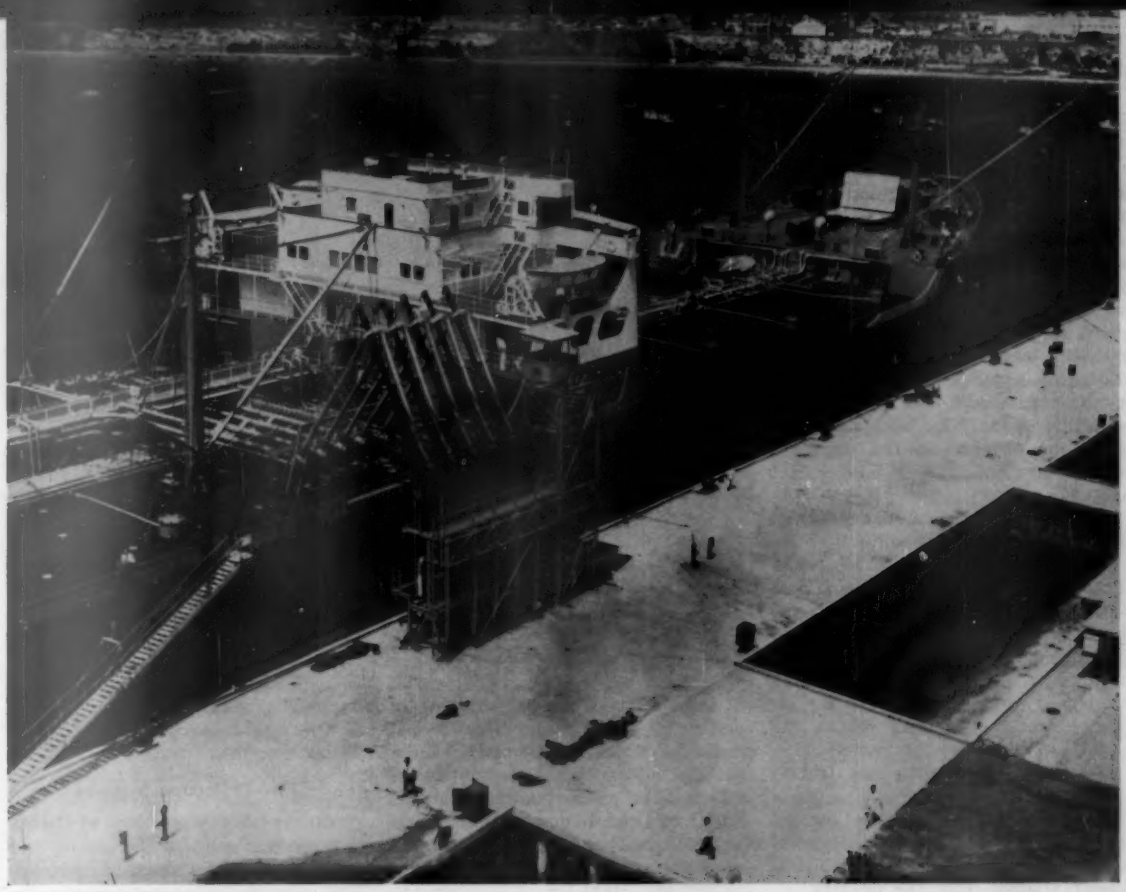


SUPERTANKER and wharf facilities are designed so that . . .

The big ones unload fast here

. . . and also take on bunker fuel at 5,000 bbl. per hour

A MODERN crude-oil transportation system has recently been completed and put into operation at Los Angeles Harbor by Union Oil Co. of California.

The new system is used for two operations. First, it is used to transfer crude oil from tankers to Union's Los Angeles refinery, a distance of approximately 5 miles. Second, it is used to transport bunker fuel oil from the refinery to the tankers. Some of the outstanding features of the new facilities are a modern ship-to-shore unloading assembly, a centralized control system, and two elaborate fire-protection systems.

The facilities were designed primarily to discharge cargoes from three 60,000-ton tankers which were constructed for Union for importing foreign crude. Commonly called supertankers, the ships have a beam of 104 ft. and a length of 810 ft., which is about three city blocks. The supertankers have a draft when loaded of approximately 42 ft.; a speed of 17.2 knots, or about 20 m.p.h.; and a cargo capacity of approximately 450,000 bbl. of crude oil.

Presented at AIEE Petroleum Industry conference, August 23-26, 1959, Long Beach, Calif.

The Facilities

A number of large construction projects were necessary before the supertankers could be brought into Los Angeles Harbor and their cargoes transferred to the refinery storage tanks. The harbor was not deep enough to accommodate the 42-ft. draft of the loaded tankers; therefore, a channel and a turning basin

BY LEONARD B. JONES

. . . project engineer in Union Oil Co.'s engineering and construction division of the transportation and supply department. He graduated from University of Colorado in 1953 (BS in chemical engineering) and joined Union Oil in 1956 after a period of service with Continental Pipe Line Co.

were dredged to a depth of 45 ft. Next, a reinforced concrete wharf was built to moor the ships. This wharf is 896 ft. in length and extends through Berths 45, 46, and 47 in the outer harbor. It is equipped with a hydraulically operated marine loading-arm assembly, together with other wharf facilities.

A 30-in. crude-oil discharge line, 6,200 ft. long, was laid to connect the wharf to terminal storage tanks. In addition, to handle flow in the reverse direction, two 12-in. lines were laid from the terminal to the wharf to supply the tankers with bunker fuel oil.

Another project was the construction of terminal and pump-station facilities at Twenty-second Street in San Pedro. Five 175,000-bbl. floating-roof tanks, four for crude and one for bunker fuel oil, were erected. Three electrically driven centrifugal pumps were installed at the terminal pump station to pump crude oil to the refinery and bunker fuel oil to the wharf. Finally, approximately 3½ miles of 12-in. pipeline was laid to connect the terminal to the refinery manifold, at which point the flow can be directed either into refinery tanks or to the Torrance tank farm, which is about 5 miles from the refinery.

MAIN-LINE PUMPS are shown at terminal and pump station.

Operations

Cargo pumps aboard the tankers are used to transfer the crude through the 30-in. line into terminal tankage. Each of the supertankers has four 600-hp. steam-turbine-driven centrifugal pumps. These cargo pumps operate in parallel and put up a pressure of approximately 125 psi. The tankers can be discharged at rates up to 36,500 bbl. per hour. This rate is dependent on several factors, such as the number of unloading arms being used, the crude level in the terminal tanks, and the number of ship's pumps operating. At the maximum discharge rate, a tanker cargo of 450,000 bbl. can be discharged in about 12 hours.

Bunker fuel for the bunkering operation is supplied from Union's Los Angeles refinery by reversing the flow direction in the 12-in. main line. The bunker fuel is pumped from the refinery at a temperature of 140° F. and is stored in a 175,000-bbl. tank at the terminal until it is needed by a tanker. The temperature of the bunker fuel in terminal storage is maintained at 125° F. by periodically circulating it through a shell-and-tube heat exchanger, using 15-psi. steam as the heating medium.

Prior to pumping the fuel oil to the tankers, the twin 12-in. lines to the wharf are displaced with 125° F. fuel oil by circulating back into terminal storage. Then as the tanker is being discharged of its cargo of crude oil, the bunker fuel is pumped to the tanker, utilizing both of the parallel 12-in. lines. The pumping rate is 5,000 bbl. per hour with two main-line pumps operating in parallel. A normal bunker for the supertanker is 40,000 to 50,000 bbl.

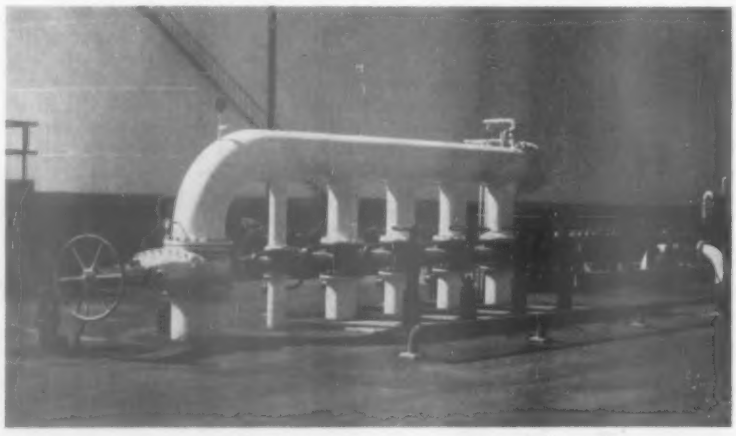
Tanker-Unloading Equipment

The marine unloading-arm assembly at the wharf is one of the outstanding features of the supertanker facilities. This equipment has eliminated the need for awkward hoses and hose-handling equipment. Five arms connect the tanker manifold piping to the wharf piping. Each arm consists of two sections of 12-in. aluminum pipe connected by swivel joints together with a swivel-jointed connecting flange for attachment to the ship's piping. The arms are controlled from a control house located on the loading-arm structure by means of a hydraulically operated cable and sheave assembly.

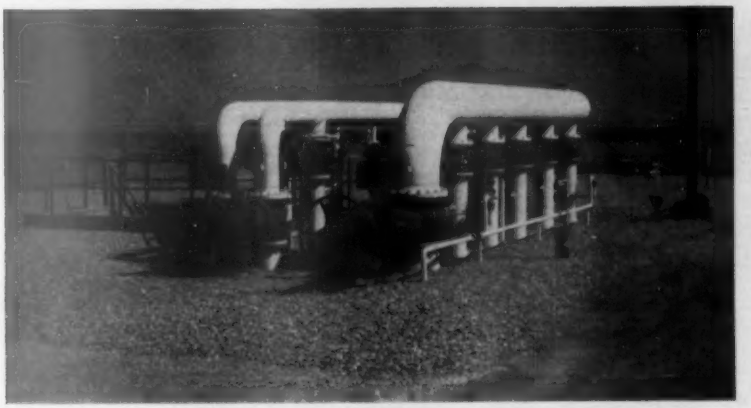
Fire-Protection Systems

Modern fire-protection systems have been installed at the wharf and terminal. At the wharf, fire hydrants, hose cabinets, and monitor nozzles are installed at various locations to provide adequate fire protection. A 20-hp. motor-driven booster pump maintains a static pressure in the fire-water system at all times when the wharf is in operation. In the event the pressure in the system drops below a set value, a pressure switch actuates a relay system which automatically starts an engine-driven fire pump. This pump is located in a fireproof building on the wharf and takes suction directly from the ocean.

A similar system is provided for fire protection at the terminal. The tank farm is surrounded by a concrete im-



TERMINAL receiving manifold.



WHARF bunker fuel and crude-oil manifold.

pounding wall having an impounding capacity equal to one of the 175,000-bbl. tanks. Inside the wall, the area is graded to drain into catch basins which in turn drain to a central sump outside the impounding wall. The sump is equipped with a high-volume pump which discharges to the suction of the main pipeline pumps. In the event of a major tank fire, this arrangement provides a means of disposing of excess oil and water from the fire-fighting operation.

An 8-in. fire-water loop encircles the tank farm outside of the impounding wall. Nine hose hydrants with six 2½-in. connections per hydrant are installed along the loop.

Three hose reels, two monitor nozzles, and a main-line pump fog system are tied into the fire-water system for protection in the pump-station equipment area. Altlhough the primary fire-water supply is from the sea, cast-steel piping is used for the entire fire-water system. The salt water is displaced from the system by fresh water after operation of any part of the fire-water loop.

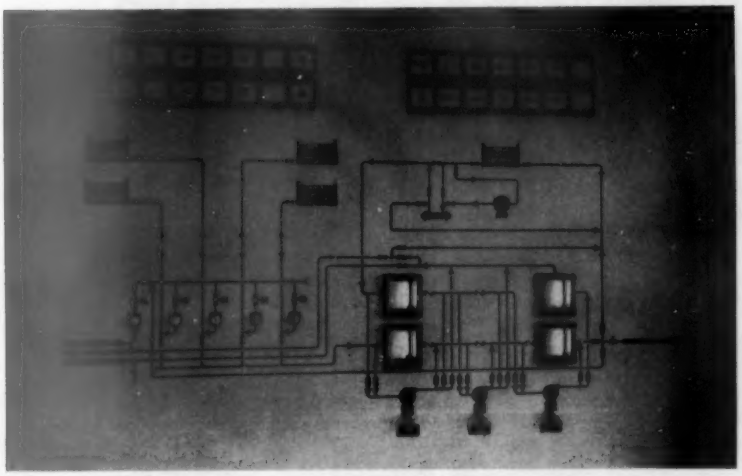
Water for the system is supplied by two 1,750-g.p.m. 150-psi. vertical turbine pumps taking suction from the ocean. The pumps are installed in a building on Wharf No. 36 across the street from the terminal, and are driven by 200-hp. gasoline engines. One pump is designed to start automatically and the other unit is started manually. Automatic engine starting is accomplished by an electrical-relay system which is actuated by a pressure switch. The starting sequence is as follows:

Static pressure of 150 to 165 psi. is maintained in the fire-water system by a 1-hp. turbine pump. A pressure switch located near the pump discharge closes if the pressure in the system decreases to 130 psi., energizing a relay. Contacts from the relay close and energize a timing-motor relay and the engine's ignition coil. Approximately 5 seconds after the timer motor has been energized, the engine starter solenoid is energized. The engine is cranked for approximately 8 seconds and released for an interval of 7 seconds if it fails to start. This cycle is repeated five times. After five attempts, if the engine does not start, another contact on the timer motor actuates a start-fail relay which lights an indicator on the control panel in the fire-water pump house. If the engine starts before five attempts, output from the engine's generator locks out control from further cranking. In case of low lube-oil pressure or high jacket-water temperature, the engine will continue to run, but indicator lamps on the control panel are lighted.

The building for the fire-water pumping equipment is of concrete blocks with a concrete roof. A sprinkler system on the roof provides additional protection to the equipment and building in the event of a fire on the wharf on which the building is located. The sprinkler system is actuated by a fusible link in one of the sprinkler heads. Fusion of this link removes pressure from a sentry-valve piston causing the valve to open and permit flow to the sprinklers.

As mentioned previously, fog nozzles are directed at the mechanical seals on the main line pumps. These nozzles are automatically actuated in the event of a fire. Elements located above each pump, when subjected to a rapid temperature rise, actuate a solenoid valve through a fire-control panel. The solenoid valve removes pressure from a sentry-valve piston causing the valve to open and admit flow to the fog nozzles.

Fire-boat connections are installed at the discharge of the fire-water pumps to provide an auxiliary source of pressure in the event of fire-water pump failure.

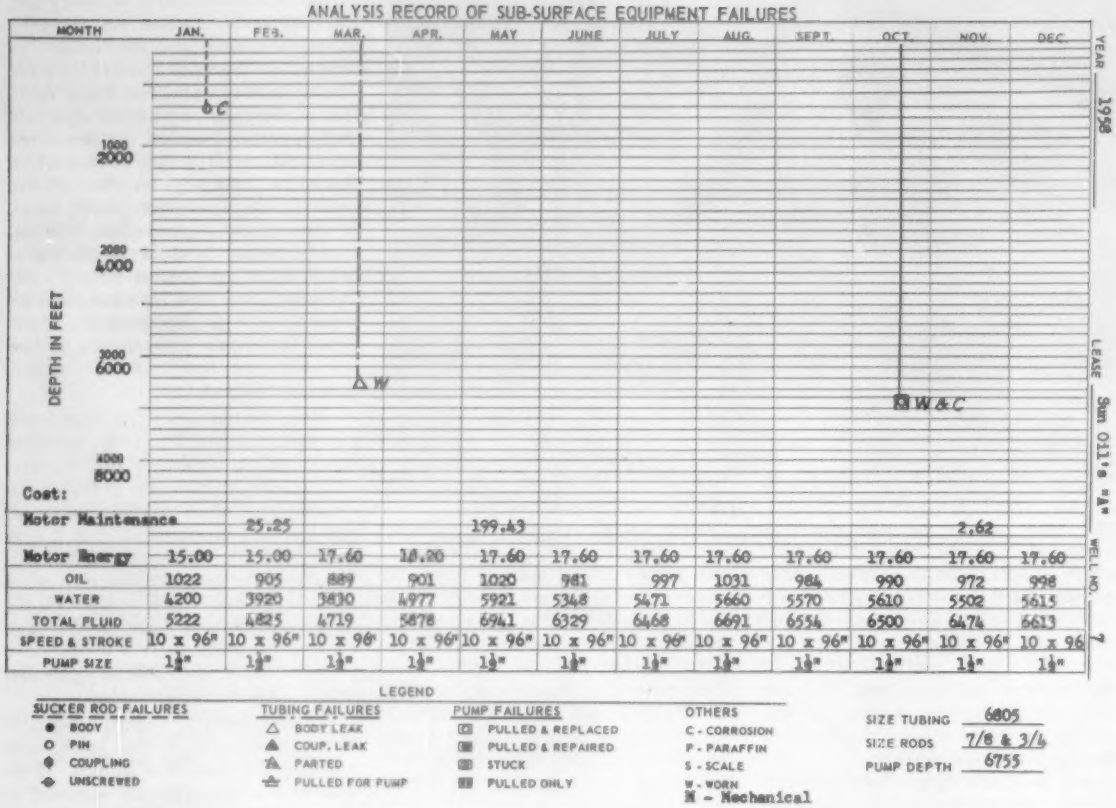


CONTROL PANEL for terminal and pump station.

System Control and Instrumentation

The basic operation is one of discharging crude oil from the tanker through the 30-in. line to terminal storage tanks. At the same time, bunker fuel is pumped from the terminal to the tanker through parallel 12-in. lines. The crude-oil discharge rate may be as much as 36,500 bbl. per hour.

The bunker-fuel loading system is designed for a rate of 5,000 bbl. per hour. The operation is controlled and monitored from centralized control panels located at the wharf and terminal. Each panel has a graphic flow diagram, together with alarm lights and recording and indicating instruments. Primary control of the tanker discharging and bunkering operation is from the control room at the wharf.



What the charts show

HERE is a 1-year record on a pumping well showing (1) a sucker-rod pin failure at 1,420 ft. due to corrosion in January 1958; (2) a tubing body leak in March, at a depth of 6,400 ft. This leak was due to wear, probably caused by rod abrasion, and (3) that the pump was pulled and replaced because of a worn and corroded condition. Maintenance costs on the driving motor are also shown, with expenditures being made in February, May, and November. Motor energy expense, fuel or electricity as the case may be, is shown on a monthly basis, along with production figures for all fluid pumped.

Opposite page

The three repair jobs shown in the chart above are detailed on the Pulling Record. Costs, and a brief description of the work done, are included. The Chemical Record shows the date of treatment and the amount of corrosion inhibitor used. Other chemicals that may be required would also be shown here. The Special Services table is used to detail the costs of caliper surveys, corrosion-coupon checks, etc., that may be required from time to time to aid in analyzing the pumping performance of the well.

Presented at the sixth annual West Texas Oil Lifting Short Course under the original title, A Graphical Study of Pumping Wells.

Use these charts to

BY BENNIE L. FRANKS
Sun Oil Co., Colorado City, Tex.

PUMPING COST per barrel of oil has accelerated rapidly with the reduction of income caused by lower producing-day schedules and the higher costs of pulling, pump repairs, and steel products. Therefore, oil companies, major as well as independents, have been forced to reevaluate costs in subsurface pumping equipment. This area often has been neglected due to the development of new wells demanding the bulk of time of the field personnel. In many cases, lifting-cost increases are due to declines in production and should be periodically checked. As deeper wells are placed on pump and larger volumes of fluids are lifted, many problems develop which previously did not exist.

Better design, study of operations, and planned maintenance of subsurface equipment can often result in reduced lifting cost per barrel of oil. A graphical history of pumping operations will help to readily illustrate problem wells and are also good guides for determining remedial action whenever it becomes necessary.

The graphical analysis is a complete record of pumping history, with costs, and can be redesigned to suit the needs of any company. They can be kept by either pumpers or other field personnel and can become a quick and easy reference to justify pulling jobs or other remedial work.

Graphic Study

A graphic study begins with plotting failures on a month-versus-depth basis. The graph considered is for a 12-month period from which annual costs can be derived. Various symbols are used to class subsurface failures such as a circle for sucker-rod failure, triangle for tubing failures, and an inscribed circle in a square for pump failures. To further explain causes for these failures, each job is classified as the result of corrosion, paraffin, scale, mechanical defects, or wearing.

PULLING RECORD

DATE	LABOR	MATERIAL	TOTAL	REMARKS
1-21-58	$147.50	$ 15.00	$162.50	Replaced 1 - 25' sucker rod and placed back on pump
3-24-58	417.00	175.00	592.00	Tbg. leak - calipered tbg. and replaced 8 joints, ran tbg. anchor
10-18-58	187.00	160.00	347.00	Plunger on pump worn and balls pitted by corrosion
Annual Cost	$751.50	$350.00	$1101.50	

CHEMICAL RECORD

DATE STARTED	TYPE	AMOUNT
1/25 - Mar.	Corrosion Inhibitor	12 gals.
Apr. - June	Corrosion Inhibitor	16 gals.
July - Sept.	Corrosion Inhibitor	16 gals.
Oct. - Dec.	Corrosion Inhibitor	16 gals.
	Total	60 gals.
Annual Cost	Corrosion Inhibitor	$120.00

SPECIAL SERVICES

DATE	DESCRIPTION - REMARKS	
3-24-58	Tbg. Caliper 6800' 2" tbg.	$340.00
Annual Cost		$340.00

Total Sub-Surface Cost = Pulling Chemical and Special Service Cost = $1561.50 Year of 1959
Total Surface Cost = Energy Charge and Motor Maintenance = $433.90 Year of 1958

diagnose those problem pumpers

Sucker-rod failures are broken down into four classifications:

1. Body breaks.
2. Pin breaks.
3. Coupling breaks.
4. Unscrewed rods.

... **Body breaks.** If during a year's operation one body break occurs it would be hard to condemn a string of rods. However, if two or more rod parts develop, then some research should be done. When a string which has given normal performance has several rod breaks, it becomes economically feasible to make a change in present operating practice. Factors which cause rod breaks are fluid environment, rod load, range load and rod fatigue.

Fluid environment often influences the service life of pumping equipment in relation to the quantity of salt, hydrogen sulfide, or carbon dioxide water handled. Chemical inhibition has been satisfactory in alleviating these corrosion failures.

Rod loads which include rod weight and pump load can definitely be a factor causing rod body breaks. Many times a well has been equipped with an efficiently designed rod string; later, fluid capacity is increased by water encroachment or well stimulation without rod-string stresses being rechecked. Or a 1¼-in. pump is pulled and replaced with a 1½-in. pump without much consideration for the added rod stress. In this change of pump sizes, the static fluid load has been increased 67%.

Range loads have caused many rod breaks without the operators realizing this fact.

Range load is described as the difference between maximum dynamic load and minimum dynamic load. It is usually expressed in per cent range load which is range load divided by minimum load. Rod manufacturers recommend that range loads should not exceed 60% of minimum load. Factors causing high range loads are fluid pounds, pump friction, scale, sand, paraffin, buckling of tubing, crooked hole, and synchronous pumping speeds.

Rod - string wear can be reduced with the aid of tubing anchors and also by increasing rod sizes for given tubing sizes. Rod guides have an application if the wear is the result of crooked hole.

... **Pin breaks.** Pin breaks are generally the result of improper makeup. If, after snapping-up rod strings, any foreign material is between the face of coupling and rod, the pin is susceptible to failure. Such breaks are common in wells below 6,000 ft. which are normally subjected to the higher stresses. Also the installers usually become tired and less efficient and fail to snap up strings sufficiently.

Pin breaks in newly installed strings are usually the result of a failure to clean the boxes and pins after storage in warehouse yards. To properly clean rods on a 6,000-ft. job adds approximately $30 and will result in a large saving if a pin break can be prevented. There is little that can be

"Average cost of pulling unit and pump repair is $235.90 for a

done for damaged pins or pins that have been corroded other than using a chemical inhibitor in the coupling to retard further deterioration.

... Rod - coupling failures. These failures, in our experience, have been limited normally to ¾ and ⅞-in. slim-hole couplings. Normally, the major cause of coupling failures is the use of hammers. Coupling failures have been laboratory analyzed and it has been found that many initial breaks radiate from hammer marks.

Another common cause of coupling failure is internal corrosion of the coupling resulting in failures at the point of the first thread of the bottom pin. This can be eliminated by changing couplings in the area of trouble. Many operators have minimized this condition by applying a chemical inhibitor in the couplings when a pulling job is in process. In other cases of deep pumping wells, some operators have changed from slim-hole couplings to standard couplings and installed 2½-in. tubing in the area of ⅞-in. rods so that fishing operations can be performed.

... Unscrewed rods. Normally this is a result of improper makeup and can be eliminated with closer supervision. Unclean boxes and pins can give the impression of satisfactory makeup and then back out as pumping is commenced, due to tubing buckling during a pumping cycle.

Tubing Failures

Tubing failures are classified into four categories:

1. Body leak.
2. Coupling leak.
3. Parted.
4. Pulled for pump.

... Tubing-body leaks. This is the most common problem in tubing leaks. Body leaks result from corrosion or worn portions of the body of a joint and can possibly be caused by plugging of the tubing or flowing with paraffin.

The most common cause is rod wear in the internal portion of the tubing. The first approach is a tubing anchor if the wear is on the bottom of the string. Rod guides plus rotation of tubing tend to minimize local wear. Respacing of couplings periodically along with pumping at the desired speeds to reduce harmonics in the pumping string is helpful. Using larger-size rods in a given size tubing also tends to reduce internal wear. If the rod wear is localized in the immediate area above the pump, either larger sucker rods, or in some cases polished rods, should be used at that part of the string.

Corrosion in the tubing often can be retarded economically with chemical inhibition, though in some cases plastic-coated tubing is desirable.

... Tubing-coupling leaks. Tubing-coupling leaks can result from improper makeup but normally are the result of continual tubing travel over a long period of time. A tubing anchor can eliminate tubing travel and can help eliminate tubing leaks if the threads are not already fluid cut to the point of a washout condition. Using the smallest-bore pump will reduce tubing travel and help relieve thread wear. Pumping at synchronous speeds and pounding fluid will accelerate tubing leaks.

... Parted tubing. Normally this is the result of corrosion or continual pounding of fluid. This is an uncommon occurrence and normally does not present a major problem. Treatments for corrosion are often successful in stopping tubing parts. Tubing anchors help eliminate parts and are always beneficial in deep - well pumping. Using the smallest possible pump, the longest stroke, and nonsynchronous speeds often will reduce tubing parts.

... Pulled for pump. It is necessary to pull tubing when the pump or rod string parts and cannot be fished. This is common where paraffin or scale accumulation occurs and prevents normal fishing jobs.

Most of the main problems of tubing failures can be eliminated with tubing anchors. Calipering and pressure testing can eliminate many potential tubing problems. Tubing testing is definitely useful on old strings which have been in service and show signs of rod wear or hydrogen sulfide embrittlement.

Pump Failures

Pump failures are classified as follows:

1. Pulled and replaced.
2. Pulled and repaired.
3. Stuck.
4. Pulled only.

... Pulled and replaced. This class represents pumps replaced that are not repairable or replaced when an available pump was on hand for exchange. A description of the pump pulled will be made to determine whether the failure was due to corrosion, scale, wear, or a mechanical defect.

... Pulled and repaired. Such a pump classification is one which has been pulled and repaired and placed back on production. Identification as to the cause of pump failure will be made as in the case of the preceding classification.

... Stuck pump. This represents wells with plunger stuck either with scale, sand, or in some cases paraffin. Classification as to the specific cause should be made.

... Pulled only. These are wells in which pulling or unseating of pumps is the only work performed. This is a common occurrence after placing a well on pump when scale or paraffin accumulations are present.

There are many different types and combinations of pumps available that could be discussed in this report. However, there are definite basic principles that are followed by most operators. Any type pump that has performed satisfactorily for 6 to 12 months is not a real problem. When a pump failure occurs in less than 4 months' service, some other type of pump should be considered.

Cup-type pumps have given good service and are good when the total fluid handled is high. However, short life has been experienced when pounding fluid conditions exist. If cup-type pumps are used, time cycling to prevent continual fluid pounds will usually increase the service life.

Stroke - through - type pumps have been very effective in producing fluids that tend to gyp up standard insert pumps. However, stroke - through pumps are limited as to the quantity of fluid handled since the maximum size in 2-in. tubing is 1¼ in. If a high capacity is not necessary, such a selection should perform properly.

There are many good-quality pumps that have done a fine job in handling corrosive fluids. However, such pumps should be used only where necessary, due to the higher pump cost.

In new fields where little information is known as to the pumping characteristics, purchasing a standard pump is the practical way to approach the problem. Inspection when the pump is pulled can guide your decision on future pump selections.

The best possible way to extend subsurface pump life is by utilizing the longest-length stroke and slowest nonsynchronous pumping speed to obtain the necessary production. Extended service life of equipment has occurred by chemically slugging wells prior to shutdown day, where treatments for corrosion or scale are being followed. In deep-well pumping, insert pumps seem to perform longer with a rod guide above the pump. They should be equipped with a larger pull rod when high volumes of fluid are being handled.

2,500-ft. well and $365.09 for a 6,500-7,000-ft. well"

All subsurface pumps, when broken down in the pump shop, should be inspected by field personnel. When considering normal expenditures of $350 for a 6,500-ft. well, correct replacement of pumps is imperative.

Further Evaluation of Subsurface Failures

To further evaluate subsurface failures, all jobs are classified as to the apparent cause, such as C-Corrosion, P-Paraffin, S-Scale, W-Worn, and M-Mechanical.

... **C-Corrosion.** If failures occur consistently in rods, tubing, or pumps as a result of corrosion, either the chemical treatment is inadequate and should be changed, or treatment should be initiated. To further evaluate, consideration should be given to the length of service, quantity of fluid handled, etc. This might help to obtain justification for considering chemical treatment. Many times, however, fatigue is a major factor in equipment failure and has been misclassified as corrosion.

... **P-Paraffin.** Often the high cost of paraffin removal will be shown if each operation is classified. Paraffin deposition can be handled satisfactorily in some cases with chemicals, mechanical scrapers, hot oiling, passing of scrapers, and plastic-coated tubing. All these expenditures should be backed up with well history to evaluate the necessity of such cost and, later, to justify the expenditures. Paraffin often causes continual unbalanced pumping conditions, thereby consuming additional energy.

... **S-Scale.** Scale deposition has been combated by complex phosphates which keep these deposits from forming. Stroke-through pumps have helped eliminate premature failures of subsurface pumps. Both have their places but must be proved economically feasible to use. Many times, periodic acid dump jobs will do a satisfactory job at a nominal cost.

... **W-Worn.** This refers to equipment that has been fluid cut or has abraded areas. If such a condition should exist in subsurface pumps, better pump selection is necessary if short performance has occurred.

Well equipment data are included on the analysis record as follows:

1. Tubing size, date installed, and condition.
2. Rod size or sizes, date installed, and condition.
3. Pump depth and bottom of the hole in feet.

With the above data and length of stroke, strokes per minute, and pump size complete, pump capacities can be calculated. All volumetric calculations should include rod stretch, tubing travel, and impulse factor. From these data, polished-rod load, correct counterbalance, peak torque, and prime-mover sizes can be determined.

From the graphical history of pumping wells, we can get a good picture of the effectiveness of the equipment.

Additional Information

(To further evaluate the economics of the particular installation, additional information is necessary.)

... **Pulling records.** To correspond with the graphical identification, the pulling-unit cost is shown for each job along with a cost for equipment replaced or repaired. This material cost may be estimated in the case of rods and tubing if this equipment is in stock and has no set value assigned. Pump-repair charges can usually be obtained exactly from pump shop tickets. The total, therefore, represents the cost of performing these pulling jobs.

... **Chemical records.** If chemical treatments are being used for paraffin, corrosion, or scale, important data such as date started, type of chemical, and quantity per quarter or 6 months should be shown. Also a cost to maintain these treatments should be shown.

... **Special services.** This represents operations not included in other sections such as hot oiling charge, paraffin scraping with pulling units, caliper surveys, rod inspections, and pressure testing of tubing. Also included is special equipment installed for better pumping operations. An accurate description of work performed and cost should be included.

Additional information can be kept on this report if it is felt that it is necessary, such as cost per month for energy, whether electrical or butane, and also monthly maintenance cost of electrical prime movers or internal-combustion engines. In the case of gas engines, an approximate monthly figure can be arrived at by determining the cost of oil, water, antifreeze, spark plug, filter replacements, magneto repairs, etc. Any motor or electrical-repair charges may be obtained if a notation is made on the report.

To obtain a yearly cost, simply total each section: pulling record, chemical compound record, special services. These totals represent subsurface cost per year. To further study lifting cost, total the energy and prime-mover costs—these two represent surface cost. Surface cost and subsurface cost represent yearly expenditures to keep this particular well in operation. By totaling barrels of oil and water produced during the year, a cost per barrel basis can be made. Many times field personnel will not be in position to complete this form. However, they can furnish all pertinent data recorded in the proper sections. If a well is in question, then a cost study can readily be made without missing some of the previous remedial work.

Field Examples

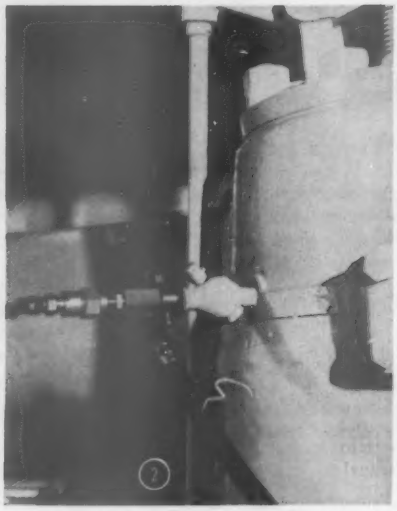
... **Example "A."** This 2,700-ft. well was placed on pump in October 1956, using second-hand, noncorrosion-resistant rods. It had its first ⅝-in. rod part at 1,275 ft. in March 1958. The second rod part occurred in May 1958, and the third in September 1958, at which time the rods were replaced. Calculated rod stress was 13,400 psi. which is 50% of maximum. The pumping speed was twelve 36-in. s.p.m. which eliminates the possibility of failure due to harmonics. Laboratory tests indicated corrosion was the reason for failure and after the third failure, one-half of the rod string was replaced. The string has since been performing satisfactorily.

... **Example "B."** This is a well that was pumping at 6,500 ft. with ten 100-in. s.p.m. The well was placed on pump in August 1956, and the first rod-coupling break occurred in October 1957 at 3,400 ft. in the ⅞-in. couplings. Second and third breaks occurred in December 1957 at 2,950 and 2,485 ft. in the couplings. The breaks were analyzed and found to be caused by corrosion in the couplings. The ⅞-in. rod with slim-hole couplings were replaced with standard-type couplings and have performed satisfactorily since.

... **Example "C."** This was a 6,600-ft. well which was placed on pump in July 1957, with 2 by 1½-in. by 16-ft. standard insert pump. In October 1958 the pull rod broke at the top of the plunger. The pump was serviced and the pull rod parted in November 1958. The normal 1⅛-in. pull rod was replaced with the ⅞-in. pull rod and has been operating satisfactorily.

... **Example "D."** This 2,700-ft. well was placed on pump in August 1956 and was pulled in April 1957 due to a scaled-up pump. A similar pump was installed, then pulled in June 1957. A stroke-through pump was used to replace the standard pump and has been in service for 22 months.

OSCILLOSCOPE with all controls on chassis . . .



PRESSURE-RATE PICKUP and air-cooled adapter . . .

Pipeliners like the engine analyzer

It points out engine malfunctions and aids in tuneup

BY B. J. MATTHEWS
Senior Engineer,
El Paso Natural Gas Co.

THE ENGINE ANALYZER has definitely found a place in the pipeline industry. It has proven a very valuable asset to plant maintenance personnel.

Its value can be realized only by repeated use. It is easily set up and operated, but interpretation of results is more difficult. Experience is extremely important because the analyzer is only as good as the man who uses it. Its immediate value is as a tuneup instrument, but as experience is acquired, it becomes beneficial in detecting and locating mechanical malfunctions. Only then is its full potential realized.

In 1958, El Paso Natural Gas Co. purchased an electronic engine analyzer for maintenance trouble shooting. After almost 2 years of experience with this instrument, we feel that the venture was successful. It has proven highly effective as a tuneup instrument and has on occasion pointed out engine malfunctions which might have otherwise gone unnoticed.

Description of the Unit

The engine analyzer is very portable and compact. It consists of seven components:

1. An oscilloscope as is shown in Fig. 1. On the chassis are located all of the controls necessary for its operation.

2. A pressure-rate pickup and air-cooled adapter as is shown in Fig. 2.

3. A vibration pickup which is merely clamped to a cylinder-head nut. See Fig. 2.

4. A synchronizing generator which provides a signal to initiate the horizontal sweep in phase with engine rotation. This is shown in Fig. 4.

5. A crankshaft timing-pulse pickup which times the analyzer to the engine. See Fig. 5.

6. A reference-level comparator which superimposes a reference line on a pressure-time diagram when comparing peak and compression pressures between the individual cylinders. This is shown in the extreme right of Fig. 1.

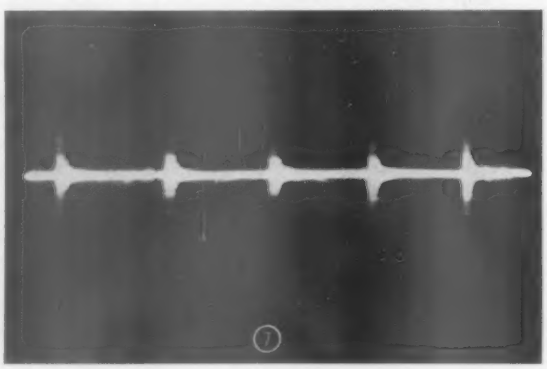
7. The ignition cables which connect into the primary circuit of the ignition system for ignition analysis. This is shown in Fig. 6.

Use of the Instrument

There are three separate but interrelated checks to be made on an engine with the engine analyzer. They are ignition, vibration, and pressure.

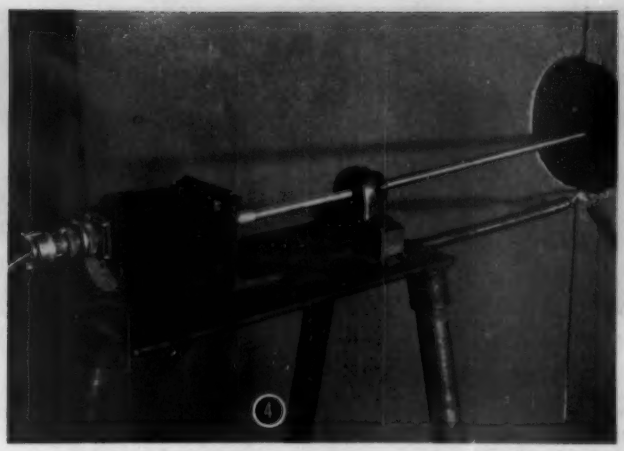
Before the engine can be analyzed, a small hole must be drilled in the flywheel to provide an air gap for the timing-pulse pickup. Then as the hole in the flywheel passes the stationary-pulse pickup, a timing mark

Ignition pattern for five cylinders . . .



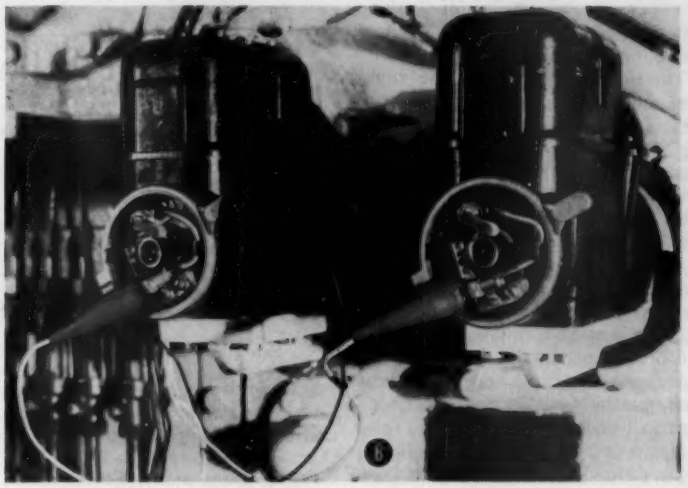
Presented at NGAA meeting, September 17, Casper, Wyo.

VIBRATION PICKUP clamped to cylinder-head nut . . .



SYNCHRONIZING generator . . .

CRANKSHAFT timing pulse pick-up . . .



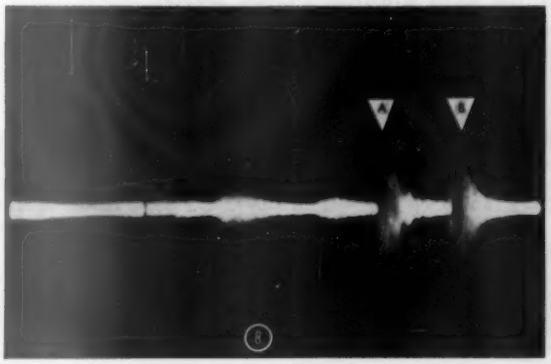
IGNITION CABLES connect into ignition system . . .

is flashed onto the oscilloscope screen.

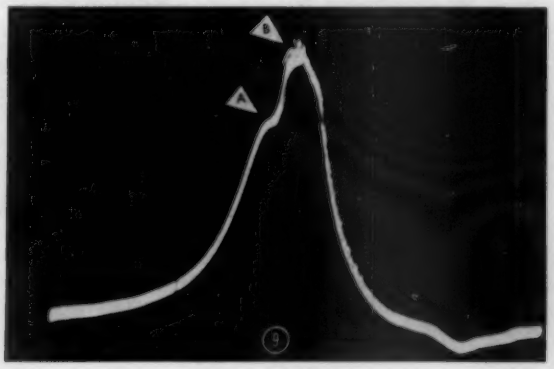
This mark will coincide with top-dead-center position for the No. 1 cylinder. Drilling of the hole at the No. 1 cylinder top-dead-center position was merely a matter of choice. Once the hole has been drilled in the flywheel then the engine need not be shut down again for the engine test.

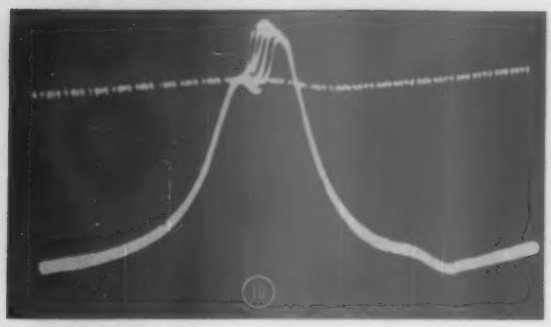
Usually, the ignition checks are made first, owing to the fact that ignition troubles are more prevalent than any other. Ignition timing can be checked very easily and accurately. Fig. 7 shows the ignition pattern for 5 cylinders, all operating off of one magneto, on a 10-cylinder engine. Length of the horizontal trace line

Too much valve lash is trouble here . . .

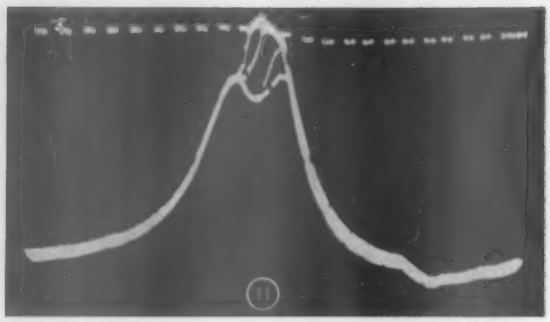


Detonation is revealed by sawtooth form . . .





REFERENCE-LEVEL LINE over pressure-time diagram . . .



MISFIRE shows up in balancing out peak pressures.

is equivalent to one crankshaft revolution.

Individual cylinder firing may be witnessed on an expanded scale. This is useful since the experienced operator can find fault in his ignition system if any exists, such as open or shorted coils and arcing points.

The next step is usually the vibration check. The pickup is clamped to a cylinder-head nut as was shown in Fig. 3. This enables the operator to examine events both normal and abnormal within the individual cylinder. With this check the operator can determine if the engine is detonating, if valve timing is correct, if there are any broken rings, and if there are any worn valve guides or leaking valves.

Detecting valve timing, detonation, and broken piston rings requires very little operator experience. Detecting such malfunctions as loose connecting-rod bearings or pins, worn valve guides, burnt valves, or piston slap is more difficult to determine and requires a great deal of experience.

Fig. 8 shows a normal vibration pattern. The event from left to right are combustion, exhaust blowdown, injection-valve opening, and injection-valve closing. The gas-injection valve here has too much valve lash as is shown by the large amplitude at "A" and "B."

The final step is the pressure analysis. Fig. 9 shows a typical pressure-time diagram for a power cylinder. "A" is the compression pressure and "B" is peak pressure. The slight sawtooth form at "B" is caused by detonation. Figs. 10 tnd 11 show the reference-level line superimposed over the pressure-time diagram.

Fig. 11 shows an occasional misfire. This check is made by using the reference-level comparator to balance out peak pressures between the individual cylinders. A similar comparison can also be made of the compression pressures. Comparison is made by reading the dial on the body of the reference-level comparator at each setting. The pressure pickup which is used is not a calibrated pickup so no absolute pressure measurement can be made.

Taking photographs of the individual patterns is a valuable aid in some instances since a permanent record can then be obtained. This is also an aid to the operator in gaining experience with the analyzer.

Complete and thorough tests on an average unit will require between 3 and 4 hours.

Nelson Refinery Cost Indexes

Published in the first issue each month in the Engineering Section.

Compiled by W. L. Nelson, Technical Editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

Refinery Construction Cost Index (1946 basis):

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1956	1957	1958	July 1959
Pumps, compressors, etc	138.2	166.5	192.0	206.7	214.7	226.5
Electrical machinery	134.9	160.0	175.0	188.9	192.7	198.0
Internal-combustion engines	126.0	150.5	164.0	173.9	178.3	179.0
Instruments	127.8	154.6	182.1	187.4	194.9	204.1
Heat exchangers	140.0	171.7	190.7	203.6	181.2	177.1
Misc. equipment average	*126.2	160.7	180.5	192.1	192.4	196.9
Materials component	149.5	174.6	190.4	201.9	204.2	207.8
Labor component	144.0	183.3	198.2	208.6	220.4	233.9
Nelson construction index	146.2	179.8	195.3	205.9	213.9	223.5

*Used in computing the Nelson Index until April 1952.

Refinery Operating Cost Indexes (1956 basis):

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1957	1958	June 1959
Fuel cost	49.6	81.0	86.5	112.4	102.6	103.1
Labor cost	73.1	88.7	90.9	106.1	105.0	103.8
Wages	52.4	81.5	88.7	104.1	105.4	111.0
Productivity	68.3	90.2	91.1	98.1	100.3	107.0
Investment, maintenance, etc.	51.2	83.6	92.0	105.4	109.5	113.0
Chemicals cost	37.0	72.1	85.7	102.2	104.4	104.8
Operating cost indexes:						
Refinery	58.5	80.5	88.7	106.4	105.9	106.6
Proceess units†	62.9	82.2	88.4	107.1	105.8	106.4

†Add chemicals, if any, as a separate index.

In 1955 and 1956, the latest 2 years for which published data are available, the chemical and petroleum industries spent over 2 billion dollars[1] for their purchased fuel and electric-power requirements. This cost for energy is 15% greater than the total expenditure for new machinery and equipment during this same period. Thus the importance of proper drive equipment is brought home. In this article two specialists give some Pointers on. . .

How to select your drive system

PART 1 OF TWO PARTS

BY W. B. WILSON AND I. H. LANDES
Industrial Engineering Section
General Electric Co.
Schenectady, New York

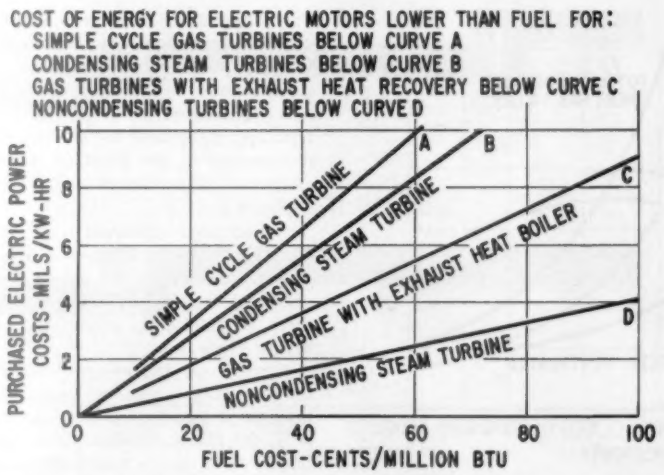
HIGHER MANAGEMENT is actively interested in increase in over-all profits that can be realized with a well-integrated and reliable drive system to minimize interruptions in the process. These profits can be a source of capital for purchase of new machinery and equipment to further increase the quantity and quality of salable products.

In addition to tangible items of investment and operating costs, there are often less-tangible items that must also be weighed. In some areas, the utility may be so located that it can furnish both the steam and electric power requirements of the refinery or petrochemical plant. With such an arrangement, the economic split between turbine drives and motor drives may be quite different from what it would be if steam is to be generated by the industrial plant.

For plant expansion, the existing electrical system and the steam systems will be important factors influencing the type or types of driver selected. In most areas, electrical systems of adequate stiffness, supplied either by the electric utility or by self-generation, can be made available to supply electric motors of any horsepower rating required. In new plants and in the expansion of existing plants, the relative costs of fuel and purchased electric power have an important effect on operating costs that must be factored into the evaluation of the different drive systems.

Fuel and power costs . . . Fig. 1 shows the areas where purchased electric power costs for motor drives are equal to the fuel costs chargeable to turbine drives. Knowing the fuel costs and the cost of purchased electric power in a given area, Fig. 1 can be used to determine the savings in energy costs that are available to offset increased investment, maintenance, or other costs. The drive systems having the lowest annual energy cost will usually have a higher investment cost.

Automatic extraction condensing turbines would fall between curves B and D. With high extraction flows, energy for the automatic extraction condensing unit approaches the noncondensing curve D. Likewise, the gas turbine with a fuel-fired exhaust-heat boiler would fall below curve C, depending on the requirement for steam or process heat.



EQUAL-ENERGY COSTS for electric motors and different types of turbines. Fig. 1.

Using Fig. 1 . . . To indicate how Fig. 1 can be used, assume a 20,000-hp. drive system with 8 mills per kw-hr. for purchased electric power and 30 cents per M.M.B.t.u. for purchased fuel. Entering the curve at 30 cents per M.M.B.t.u. we see that noncondensing turbine power is equivalent to about 1.2 mills per kw.-hr. and the condensing turbine about 4.2 mills per kw.-hr.

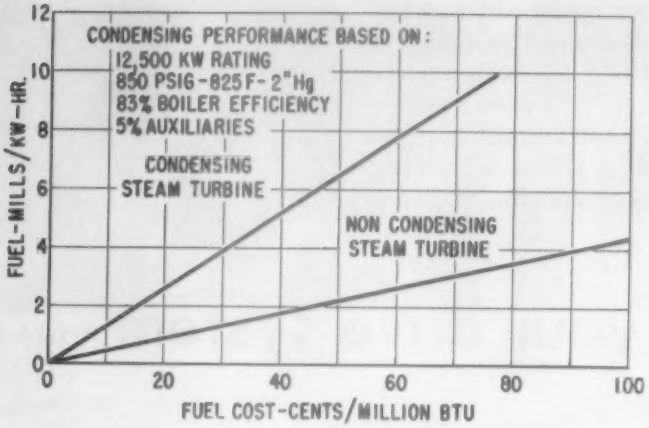
Fig. 1 assumes 10% total losses for motor, electrical system, and any speed-increasing gears that may be required for motor drives. This, together with the 0.746 conversion from horsepower to kilowatts, results in a multiplying factor of 0.83 to convert drive horsepower into kilowatts to determine purchased-power costs for an electric motor.

The annual gross saving in energy costs with steam turbine drives instead of electric motor drives using purchased power is:

Condensing—8,500 hours per year x (20,000 hp. x 0.83 purchased kw./hp.) x (8 mills - 4.2 mills)/kw.-hr. = $536,000 per year.

Noncondensing — 8,500 hours per year x (20,000 hp. x 0.83 purchased kw./hp.) x 8 mills - 1.2 mills)/kw.-hr. = $960,000 per year.

Based on assumptions in the example, the saving in energy (fuel) costs for a condensing turbine drive system is more than $500,000 per



FUEL CHARGEABLE to electric power generation in industrial plants. Fig. 2.

year compared to purchased power for an electric-motor-drive system. If process steam requirements were large enough to permit application of a noncondensing-turbine-drive system, saving in energy cost would be almost 1 million dollars per year.

There are capital, maintenance, and other costs that must be included with energy costs to determine which type of driver or combination of drivers is most economic for the application being studied. The system with lowest energy cost is not necessarily the most economic.

Fuel costs chargeable to the generation of electric power with an industrial turbine-generator are shown in Fig. 2. In many plants the kilowatts to power the motors are generated with large turbine-generator units, exhausting or extracting steam for process use.

Driver efficiency . . . In Figs. 1 and 2 it is assumed that all heat in the exhaust of noncondensing steam turbines, the extraction from automatic extraction condensing turbines, or heat recovered from gas-turbine exhaust is required in process. With this assumption, variations in turbine rating or initial or exhaust steam conditions do not affect the fuel chargeable to the noncondensing turbine. Steam conditions and turbine efficiency do, however, have a great effect on the quantity of this low-fuel-cost "byproduct" power that can be purchased by the noncondensing turbine.

Table 1 shows the marked effect of unit size and type of turbine on efficiency. Per unit of steam required for process, over twice the quantity of low-fuel-cost byproduct power can be generated in a 20,000-kw. turbine generator as can be generated in a 400-kw. single-stage unit. Even though this table is based on kilowatts, efficiency of mechanical-drive turbines has similar variation with rating. Of course, effect of horsepower rating on efficiency of gas turbines and condensing steam turbines, as well as the steam conditions, has a direct effect on fuel chargeable to power with these types of turbines.

The availability of byproduct fuels or recoverable waste heat is also a factor to be considered in the over-all evaluation. These sources of heat must usually be supplemented by purchased fuel even when no turbine drives are installed. When fuel must be purchased in all alternatives being considered, evaluations of turbine drives can be simplified by simply looking at the difference in purchased fuel and purchased electric power required for alternate drive arrangements.

TABLE 1—EFFECT OF UNIT SIZE AND EFFICIENCY ON BYPRODUCT POWER GENERATION

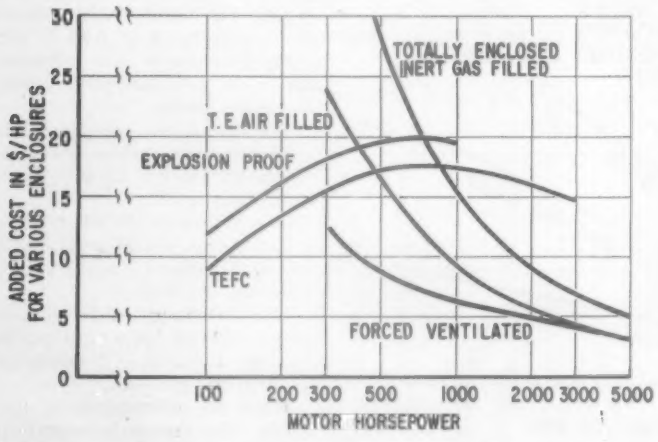
Type Prime Mover	Approx. Efficiency %	Approx. Byproduct Power Per 10,000 lb./hr. Steam Flow Expanded from 600 psig.—750°F. to 50 psig.	
400-kw. single-stage turbine-gen.	40	263 kw.	100% (Base)
2,500-kw. multistage turbine-gen.	69	454 kw.	172%
7,500-kw. turbine-generator	76	500 kw.	190%
20,000-kw. turbine-generator	82	539 kw.	205%

Motors

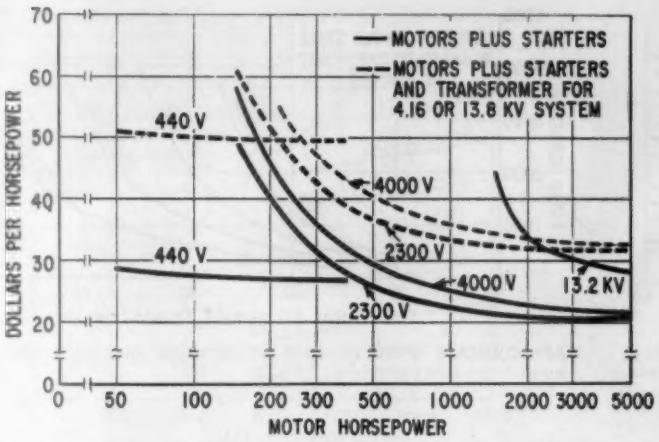
Widely used in refinery and petrochemical industries for many years, reliability of motor-drive systems is now accepted by many as equal to any other drive system. Motor drive systems have a greatly increased acceptance because of:

- The lower first cost of motor drive systems for many applications.
- Simplicity of operation and maintenance.
- Improvements in electrical systems and equipment for electric power distribution in the plant to minimize electrical disturbances and interruptions.
- Increased reliability of power supplied from the electric utility.
- Developments in motor enclosures and cooling systems to simplify their installation, operation, and maintenance.

Compressor and pump speeds range up to 10,000 r.p.m. or more. Since maximum speed of a 60-cycle motor is 3,600 r.p.m., stepup gears are required with many motor-drive applications. For a given rating, the motor price varies with speed. Likewise, gear



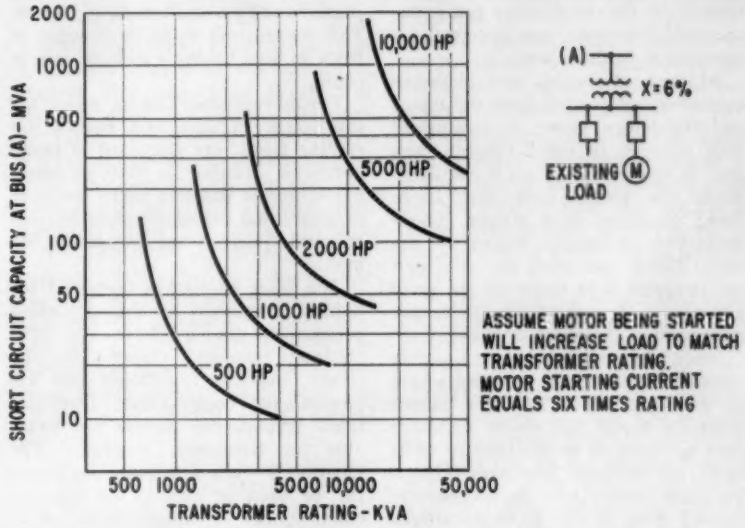
ADDED COST for various types of motor enclosures. (Dripproof construction used as the base for comparison.) Fig. 3.



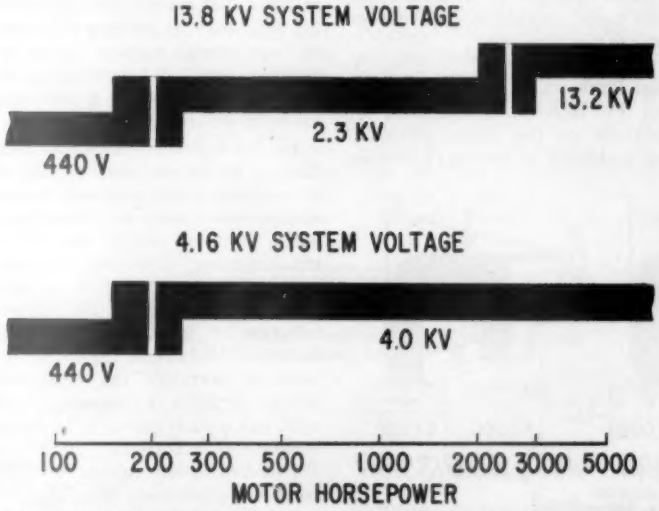
ESTIMATED COST of 1,800-r.p.m., dripproof induction motors and associated electrical equipment as a function of motor voltage. Fig. 4.

prices vary with output shaft speed and gear ratio. Therefore, it is important to be sure that motor speed is selected to give the lowest installed cost for the motor and gear combination.

Torque requirements for centrifugal compressors and pumps do not usually pose a problem for either a synchronous or an induction motor. The squirrel-cage induction motor is the general-purpose work horse which usually has a lower first cost than a synchronous motor, particularly when the motor starter and excitation equipment are included in the cost comparison. However, the synchronous motor has a lower first cost for the higher-horsepower slow-speed applications. As a general rule of thumb, when the driven equipment requires more than 1 hp. per r.p.m., the synchronous motor and its control equipment may have lower initial cost than an induction motor.



EFFECT OF MOTOR SIZE on required system short-circuit capacity and transformer rating, assuming 20% voltage drop. Fig. 6.



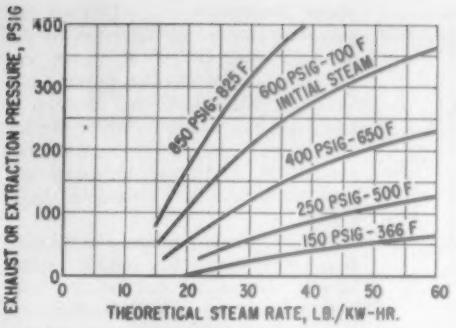
RECOMMENDED MOTOR HORSEPOWER RATING as function of motor voltage for 13.8-kv. and 4.16-kv. systems. Fig. 5.

Motor enclosures . . . One of the prime factors in the selection of the motor is the choice of motor enclosure. In the smaller motor sizes (200 hp. and below) the selection is fairly easy—a dripproof enclosure for indoor locations, totally enclosed fan cooled for outdoor locations and explosionproof for hazardous locations.

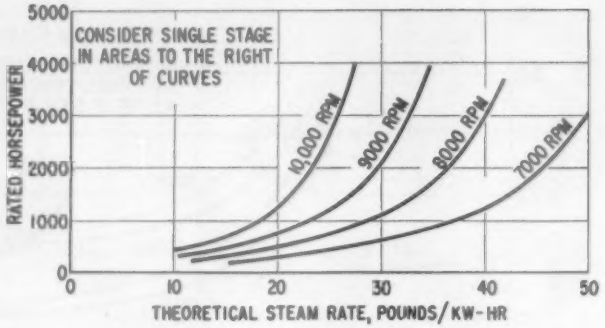
But, for the larger sizes the decision is not so obvious. For outdoor installations, the choice has usually been between weather-protected, totally enclosed fan-cooled, forced-ventilated, and totally enclosed water-cooled systems. The weather-protected motor has the lowest first cost of these systems. As a result of developments in motor-insulation systems, some now use modified dripproof enclosures for motors rated 4,000 volts and below where weather-protected or forced-ventilated motors were formerly specified.

Although totally enclosed fan-cooled induction motors are available in ratings of 3,000 to 5,000 hp., a totally enclosed motor with air-to-water heat exchanger has lower first cost above 500 hp., as shown in Fig. 3. Fig. 3 shows the approximate increase in price for several of the more popular type enclosures compared to dripproof.

In hazardous locations, such as Class I, Group D, Division 1 areas, the choice is either explosionproof (Underwriters Laboratories Labeled) or inert-gas-filled motor construction. Designing to contain an internal explosion is the major problem limiting the maximum economic size of the explosionproof motors. When drive requirements grew beyond the 1,000



VARIATION OF THEORETICAL STEAM RATE for different turbine exhaust or extraction pressures. Fig. 7.



APPROXIMATE SPEED at which single stage and multistage turbines have same efficiency. Fig. 8.

to 2,000-hp. limit of the explosionproof induction-motor construction, the inert-gas-filled motor, designed specifically for the refining and petrochemical industries, was accepted for application in these areas.

At time of startup, any explosive atmosphere is purged from the motor and the entire motor is pressurized with nitrogen or other suitable inert gas. In operation, the gas is circulated inside the motor with heat losses being dissipated in a normal gas-to-water heat exchanger. Except for the initial filling operation, the only inert gas required is to make up the small loss of gas (less than 100 cu. ft. per day) around the shaft or other seals.

Since the motor is continuously pressurized with inert gas and sealed so explosive vapor mixtures cannot enter the motor, the motor enclosure does not have to be designed to withstand an internal explosion. Inert-gas-filled motors may be successfully applied even in the more hazardous locations, such as Class I, Division 1, Groups A, B, and C, because they are not affected by the explosiveness of the surrounding atmosphere.

Because of the higher cost of explosionproof and inert-gas-filled motors, other types of construction have been applied depending upon the degree of hazard present and upon the plant designer's attitude toward the risks involved. For example, totally enclosed air-filled motors have been used in which the motor enclosure is pressurized by a small makeup blower. This makeup air must be brought in from an area having a suitable atmosphere.

Forced-ventilated motors, which are still lower in cost and require no cooling water, are also used in many instances. Suitable air from an external source is supplied under pressure to assure that the surrounding hazardous atmosphere is not drawn into the motor.

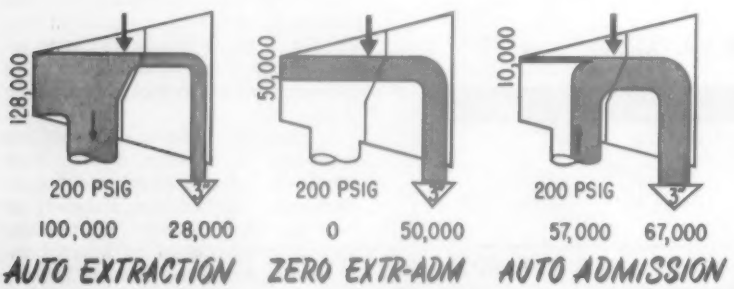
The same enclosures described for induction motors in the preceding paragraphs are available for synchronous motors, except for the totally enclosed fan-cooled and explosionproof construction. Inert-gas-filled synchronous motors are available for hazardous locations. For Division 2 areas any motor enclosure can be used as long as the slip-ring compartment is explosionproof or is enclosed and pressurized. If the exciter cannot be located outside the hazardous area, such as in a pressurized control room, explosionproof exciter enclosures are available.

Voltage levels . . . The motor voltage cannot be selected independent of an analysis of the entire electrical system supplying the energy. Likewise, the proper design of the distribution system depends upon the size of the total motor load and individual loads, as well as circuit and switchgear capacity limitations.

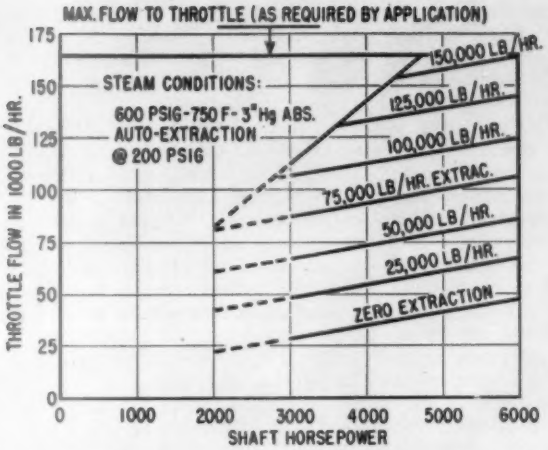
Because refineries and chemical plants usually occupy a large area with fairly wide separation between individual process units, electric-power requirements can best be supplied by relatively small load-center substations located in or near the load area. Power is distributed to the different load areas at the distribution voltage level and then transformed to the utilization voltage best suited for loads in each area. Individual motors and grouped motor control are then fed from the substation with relatively short feeder circuits.

Circuit arrangements . . . The actual circuit arrangement could be either a radial system or a secondary selective system. A radial system is low in cost, simple, and easy to operate. However, the secondary selective system has all the appealing quality of the radial system, and in addition, the secondary tie permits maintenance of equipment without interrupting essential load. A combination of the system is included as a part of the example which follows later.

In these industries where motors take a large per cent of the total electric-power requirement, their size and location must be "factored in" when selecting voltage for the electrical system. The total amount of power to be transferred is, of course, the major factor in the economic selection of the distribution voltage. Below 10,000-kva. capacity, 4,160 volts is normally the best choice. Above 20,000-kva. capacity, 13,800 volts will usually prove to be the most economical. Between 10,000 and 20,000-kva. either voltage level might be more economic. But, if there is possibility of system growing above 20,000-kva., then 13,800 volts should



ALTERNATE STEAM FLOW PATHS in automatic extraction-admission-condensing turbine with initial steam at 600 psig., 750° F., and turbine output of 6,000 hp. Fig. 9.



TURBINE PERFORMANCE of 6,000-hp. single auto-extraction-condensing units. Fig. 10.

be considered to permit any load growth desired.

With a 13,800-volt system, motors above about 3,000 hp. will probably be served direct, those 3,000 hp. down to about 250 hp. will be served at 2,400 volts through a substation located in the various load areas, and the smaller motors will be fed from 480-volt load centers. The rating at which higher-voltage motors become economical is dependent upon the price of starting and distribution equipment, as well as on the price of motors themselves. These various costs are combined on the curves of Fig. 4.

With a 4,160-volt system, motors rated 200 hp. and below will normally be supplied from 480-volt load centers and the larger motors direct from the 4,160-volt system.

In an effort to combine all these application factors into the most convenient form for ready reference, the bar chart shown in Fig. 5 has been prepared. The heavy vertical lines that extend across two voltage bars indicate the horsepower at which the costs are the same at either voltage.

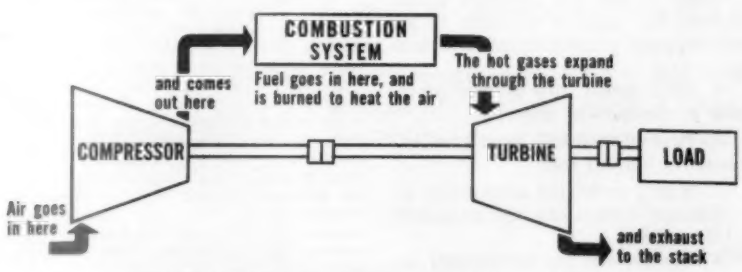
Motor controls . . . Once the proper motor has been selected, it logically follows that consideration must be given to the selection of adequate control equipment. Full-voltage starting should always be the method of starting first considered because of the low initial cost and the simplicity of the equipment. Reduced-voltage starting should only be considered after it is positively determined that full-voltage starting causes a system voltage drop higher than can be tolerated.

The effect of system short-circuit capacity and substation transformer capacity on the maximum size motor that can be started with 20% voltage dip is shown in Fig. 6. These curves are based on a system load equal to transformer rating when the motor being started is in normal operation.

For 440-volt motors, combination starters (with fuses or circuit breakers) or electrically operated low-voltage air circuit breakers can be used.

For 2,300-volt motors to 1,500 hp. and 4,000-volt motors to 2,500 hp., magnetic controllers with high-interrupting-capacity current-limiting fuses are available. Metal-clad switchgear is used for the larger motors and is often selected for the smaller motors. Magnetic controllers, especially designed for the oil industry, are available for Class I, Group D, Division 2 areas for motors up to 700-hp. rating.

For 13,200-volt motors, metal-clad switchgear is used for motor starting.


COMBUSTION SYSTEM
Fuel goes in here, and is burned to heat the air
The hot gases expand through the turbine
and comes out here
COMPRESSOR
TURBINE
LOAD
Air goes in here
and exhaust to the stack

CYCLE DIAGRAM of simple-cycle gas turbine. Fig. 11.

Steam Turbines

Mechanical-drive steam turbines are available in ratings to 25,000 hp. or more as required to match the application requirements. These custom-made turbines can be manufactured from proven component parts for the steam conditions most economic for the over-all application.

The steam turbine has wide acceptance in this industry because:

- Turbine speeds up to 10,000 r.p.m. or higher (depending on horsepower rating and on steam conditions) can be selected to match speed of driven equipment without need for stepup gear.
- The inherent wide adjustable speed range is an advantage to many when evaluating process operating flexibility.
- Low-pressure steam for process or for smaller mechanical-drive turbines can be supplied from the turbine's extraction or exhaust.
- Admission or extraction-admission turbines can generate power by taking excess steam available from process units or from the exhaust of other turbines and expanding it to condenser or to lower process pressure level.
- Governing can be provided which automatically responds to any process variable to be controlled, such as pressure, flow, temperature, etc.
- The basic turbine is acceptable for installation in areas where explosive atmospheres exist.

Before leaving the subject of steam turbines, a quick review of turbine types and their performance will help to indicate their areas of application.

Staging . . . The lower cost of the single-stage turbine makes it the economic choice for many of the smaller drivers in the oil industry. The single-stage turbine will usually have lower efficiency than a multistage turbine. The horsepower that can be produced with a fixed amount of steam flow is a factor that must be evaluated in the economic selection of single versus multistage turbines.

In applications where the ratio between throttle pressure and exhaust pressure is not very high, energy available from each pound of steam is relatively low. When available energy is low, a single-stage turbine may be more efficient than a multistage turbine, particularly if the operating speed is high.

Theoretical steam rates are a convenient measure of energy available in expanding steam. Theoretical steam rate is simply the pounds of steam required to produce a unit of power

with a theoretical turbine having 100% efficiency. Theoretical steam rate tables were published[5] by ASME in 1938.

Use of these tables simplifies our job tremendously by eliminating the need for determining available energy from the Mollier diagram for each combination of steam conditions being considered. Theoretical steam rates listed in the tables are in pounds of steam per kilowatt hour. Theoretical steam rate in pounds per horsepower hour can be determined by multiplying the figures in the table by 0.746.

Fig. 7 shows how theoretical steam rates vary with exhaust or extraction pressure for various assumed initial steam conditions.

The curves of Fig. 8 show areas where the single-stage turbine will probably be more efficient than multistage units. In an application with TSR=25 lb./kw.-hr., the efficiency of single and multistage units would be approximately the same for a 500-hp. unit at 7,000 r.p.m., a 700-hp. unit at 8,000 r.p.m., a 1,200-hp. unit at 9,000, or a 2,600-hp. unit at 10,000 r.p.m. With a theoretical steam rate of 30 (shorter energy range) the efficiencies would be equal at lower speeds.

In applications where steam conditions and power requirements permit application of a single-stage unit, lower capital cost of the single-stage unit may warrant its evaluation even when efficiency is lower than for a multistage turbine.

The condensing turbine is used for applications requiring shaft power only and where any requirement for process heat is provided from other sources.

The noncondensing turbine is the work horse in the refining and petrochemical industries. When its exhaust steam can be utilized for process heat or as the steam supply to other turbine drives, the noncondensing turbine has the lowest heat requirement of any driver.

Turbine-exhaust flow varies as horsepower requirement of the driven equipment changes. To meet power demands when process steam requirements change and to prevent blowing steam to atmosphere, the over-all system must include other equipment that can provide or absorb the difference in steam flow required for process and that exhausted by the turbine.

Automatic extraction . . . One or more automatic-extraction, automatic-admission, or automatic admission-extraction turbines can be installed to compensate for these swings in steam use and, at the same time, control the steam pressure in one or more process lines. These turbines automatically extract additional steam when the process requires more than is being supplied by other sources and admits steam for further expansion in the turbine when there is an excess of steam in the process system.

Horsepower output can be maintained constant or varied simultaneously as required by action of the turbine's control mechanism which automatically varies the turbine inlet and exhaust steam flows are required. The diagram in Fig. 9 illustrates how variations in steam flow can be accommodated by an automatic admission-extraction turbine while maintaining constant shaft output.

The performance curve for a 6,000-hp. single automatic-extraction condensing turbine is shown in Fig. 10. The turbine is designed for initial steam conditions of 600 psig. - 750° F. with automatic extraction at 200 psig. By referring to the curve, you can see that a constant 6,000-hp. output can be maintained with a throttle flow of 48,000 lb. per hour when there is no extraction.

Throttle flow is 126,000 lb. per hour when 100,000 lb. per hour is extracted. As extraction flow is increased, the required flow to exhaust decreases. For the example cited, the condenser flow decreases 22,000 lb. per hour when extraction flow was increased 100,000 lb. per hour.

Gas Turbines

The combustion-gas turbine is a self-contained prime mover that has found many process applications in the past 10 years.

The major components and the operating cycle for the combustion gas turbine are shown in Fig. 11. Basically, it consists of a compressor, a combustion system, and a turbine.

The turbine recovers energy from the hot gases as they expand to atmosphere or to process equipment for heat recovery. In the simple open-cycle combustion-gas-turbine arrangement, about two-thirds of the turbine output is required to drive its own compressor and about one-third is available for driving the external load.

Some of the gas turbine's useful outputs that make it attractive in the refining and petrochemical industries are:

1. Shaft power—for electric generator or mechanical drive.

2. Heat—recovered from the exhaust for various uses.

3. Highly preheated combustion air —Exhaust contains approximately 17% oxygen.

4. Compressed air for catalyst regeneration or other chemical processes that can be operated at gas turbine cycle operating pressure and hot gas of acceptable cleanliness is available from the process for expansion through the turbine.

In some processes, gas of suitable cleanliness and at some elevated pressure and temperature is available as a byproduct. A conventional flow gas turbine can then be used to produce horsepower by expansion of this gas to atmosphere or to some lower pressure for further process use. This type of application will not be covered in this paper.

Part 2 of this article will appear in the Journal next week.

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BOOK

THERMODYNAMICS. By Gordon J. Van Wylen. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 567 pp. $7.95.

This text acquaints the reader with the physical and mathematical aspects of thermodynamics, and is written from an engineering perspective.

The author first treats basic definitions and concepts, and then presents a thorough analysis of the first law of thermodynamics, including flow into an open system and the conservation of mass.

After further discussion, the author rounds out the first half of the text with a unique development and arrangement of the material involving the concepts of availability and irreversibility — two powerful tools for analysis that are now commanding greater attent on in engineering a analysis.

The second section of the volume treats processes in reciprocating machinery and cycles in two separate chapters. The author discusses one-dimensional flow through nozzles and orfices, and axial flow through blade passages. Concluding chapters review the mathematical and physical aspects of Maxwell relations and equations of state, chemical reactions with emphasis on combustion, and equilibrium, with particular attention to chemical equilibrium of ideal-gas mixtures.

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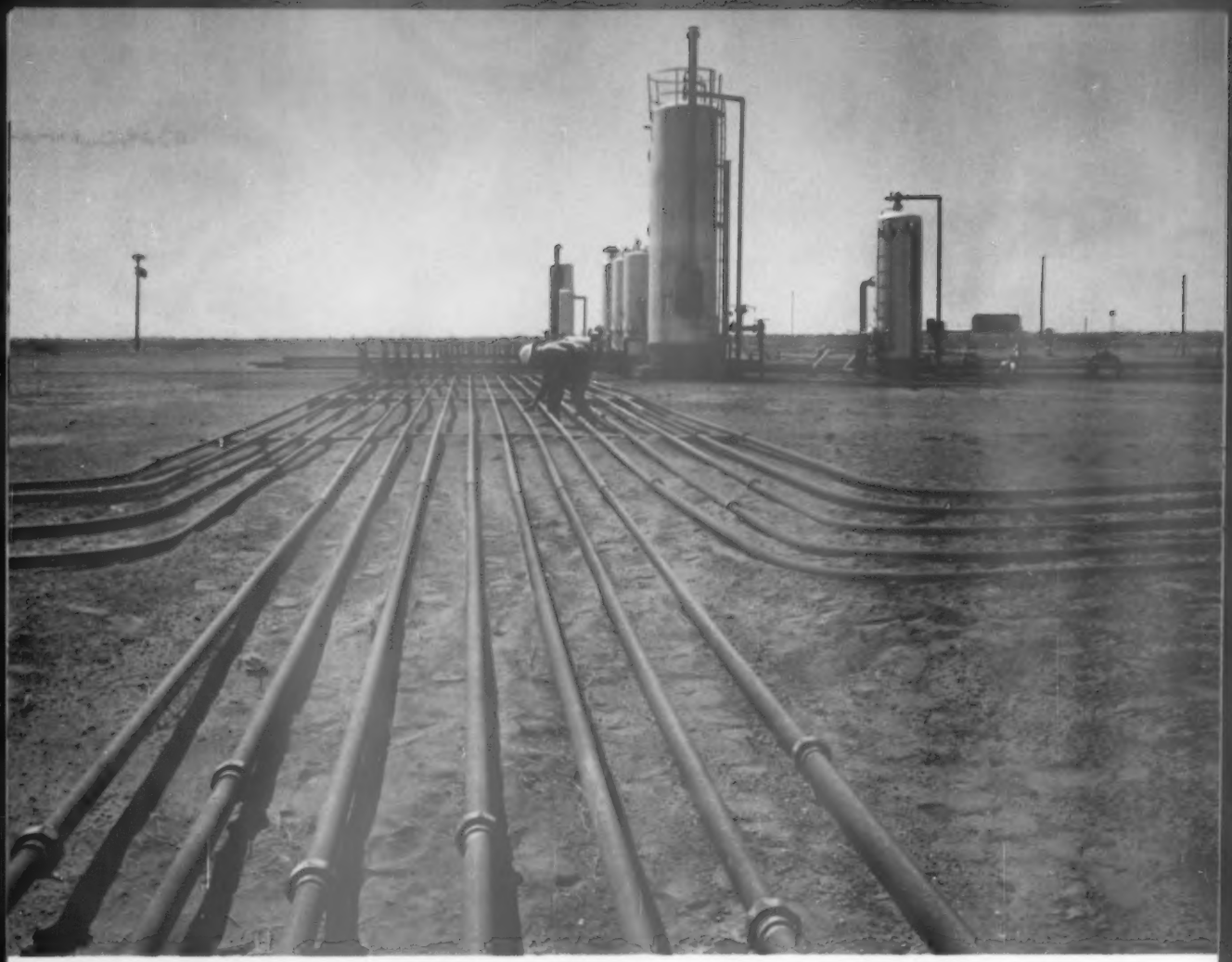
				Grade D	Grade E	Grade G†	Grade D	Grade E	Grade G†	Grade D	Grade E	Grade G†
Inches	Pounds	Inches		PSI			1000 Lbs.			PSI		
2⅞	10.40	.362	2.151	10730	13210	18980	157	214	300	12120	16530	23140
3½	★ 9.50	.254	2.992	—	8080	11610	—	194	272	—	9530	13340
	13.30	.368	2.764	9170	11290	16230	199	272	380	10120	13800	19320
	15.50	.449	2.602	10900	13420	19290	237	323	452	12350	16840	23570
4	★11.85	.262	3.476	—	7080	10170	—	231	323	—	8590	12040
	14.00	.330	3.340	7380	9080	13060	209	285	400	7940	10830	15160
4½	★13.75	.271	3.958	—	6280	9030	—	270	378	—	7900	11070
	16.60	.337	3.826	6760	8310	11950	242	331	463	7210	9830	13760
	20.00	.430	3.640	8420	10370	14910	302	412	577	9200	12540	17560
5	★15.00	.296	4.408	—	6130	8810	—	328	459	—	7700	10880
	19.50	.362	4.276	6550	8060	11590	290	396	554	6960	9500	13300
5½	21.90	.361	4.778	5770	7100	10200	321	437	612	6320	8620	12060
	24.70	.415	4.670	6800	8370	12040	365	497	696	7260	9900	13860

★ Weights are listed as tentative by API. †Grade G is 105000 psi Minimum Yield Strength Material

More on the next page . . .



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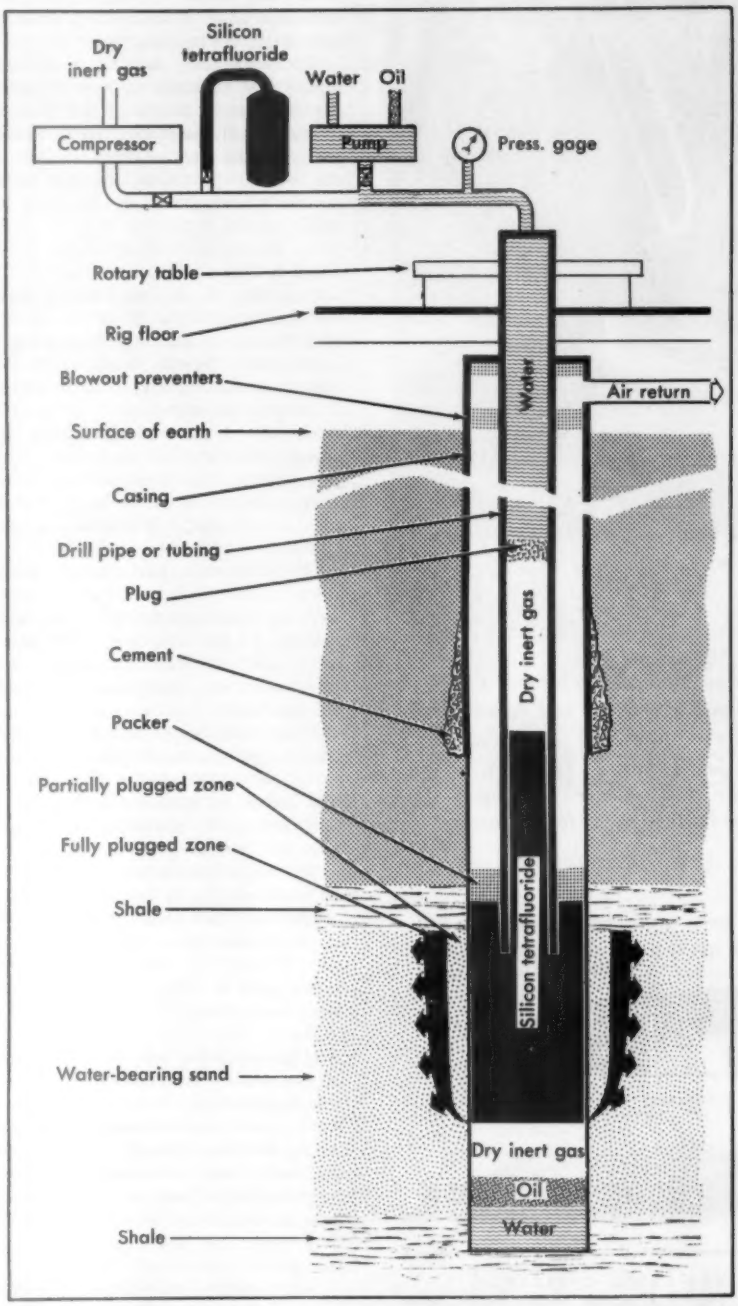
Water-shutoff treatments for air and gas drilling—how successful are they?



WATER SHUTOFF by means of silicon tetrafluoride gas treatment promises to make air drilling applicable even where prolific water-bearing formations are encountered.

Solution to one of the big problems in air and gas drilling may now be in sight. Squeezing with silicon tetrafluoride gas promises to make water shutoff routine in most cases and to reduce it significantly in the rest.

BY CHARLES K. SUFALL
Superintendent, Technical Drilling Services, Midland, Tex.
and
ED McGHEE
Drilling Editor
The Oil and Gas Journal

THERE'S GOOD NEWS for air and gas drillers as a result of the use of silicon tetrafluoride gas treatments in shutting off downhole water zones.

Three out of each four jobs with the new technique have been successful in that drilling with air or gas could continue economically afterward. Of these successful wells, water shutoff was complete in about half; in the remaining jobs, water production was cut at least in half.

Thus, a long stride has been taken in defeating one of the two big problems plaguing air and gas drilling. When water shutoff has been reduced to routine and sure procedure by this method, then only the problem of crooked hole will remain in making air drilling more widely usable.

On the one unsuccessful job in each four silicon tetrafluoride treatments, a major reason for lack of success has been the failure to drill the entire permeable zone before squeezing. Thus, there is no reason to believe that the success ratio of the squeeze jobs can't be further improved in the future.

Equally as impressive as the initial success of silicon tetrafluoride is the way these treatments have continued to withhold water during subsequent drilling. In one well drilled in West

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WATER SHUTOFF

"Fifty drilling days saved as result of successful squeezeoff."

Texas a 5-bbl. per hour water zone was squeezed off when the hole reached 6,200 ft. Then, during the next 2 weeks the hole was gas drilled to a point below 12,500 ft. and the squeezed zone produced no measurable water during that time.

The contractor on this well estimated that he saved at least 50 drilling days as a result of the success of the water squeezeoff. While this is probably the outstanding example of the staying power of the gas treatments, other jobs have also held up well.

Score to date . . . Up until the time of this writing, Technical Drilling Services had performed 18 of the silicon tetrafluoride treatments. The work is done under license from Gulf Research & Development Corp. which developed the technique.

In one of the wells in which silicon tetrafluoride was used, three separate zones were treated. The zones were squeezed off one at a time as they were drilled. Water shutoff was complete in all three.

On three wells, two separate zones were treated. Twice, the water zones were squeezed separately as they were drilled. In the third well, both zones were drilled before either was squeezed; then, each zone was treated separately.

There have been two wells in which an attempt was made to resqueeze a water formation after a first attempt had failed. In both wells the second squeezes were unsuccessful just as were the first ones.

The 18 total jobs have been at wells in Andrews, Pecos, Crane, and Reeves counties in West Texas; in Lea County of Southwest New Mexico; in Latimer County of East Central Oklahoma; and in Pope and Logan counties of western Arkansas.

Best prospects for success . . . Because of the weak gel deposited by the silicon tetrafluoride, it works best when water is coming from intergranular or intercrystalline porosity as in sands and many limes. If water comes from large openings such as solution channels or fractures, there seems to be little hope of shutting it off with the gas.

Some vuggy formations have been successfully treated. If vug structure is such that there is a narrow constriction in which the silicon gel can

wedge, then water can be shut off. Otherwise, the formation will likely continue to produce water after treatment.

The weak gel resulting from silicon tetrafluoride gas is actually one of the advantages of the material. There is no danger of sticking squeeze tools in the hole when treating by this method.

Some important precautions . . . Treating a water zone with silicon tetrafluoride is relatively simple. Surface equipment is commonplace; and bottom-hole tools are conventional. The jobs are unusual, however, in that it may be necessary to handle as many as three gases in addition to water and oil.

In spite of the simplicity of the equipment, there are precautions to take in order to insure success. First, it is important that all of the water-bearing formation be exposed to the well bore. Examples of this are two of the wells thus far treated. Both jobs appeared to be completely successful, with all water shut off.

When drilling was resumed, water appeared in the returns almost immediately. Some thought at first that the squeeze job had broken down and that water was again flowing from the squeezed zones. However, in both instances, subsequent logs showed that the water was coming from untreated formation which lay immediately below the bottom of the hole at the time the well was squeezed.

It is also important that some hole be cut below the water zone. This leaves a "rat hole" into which trash and cuttings can fall. Thus, there is no fillup against the face of the water formation which would interfere with a successful squeeze.

For a successful treatment, it is extremely important that the hole be clean. This usually means "slugging" the hole with foaming agent before the bit is pulled from the hole. The foaming agent should aid in removing cuttings which air or gas alone couldn't lift out.

Most also consider it a good precaution to continue blowing the water out of the hole for a time. Allowing the formation to produce, perhaps, may cause a pressure drawdown. Result should be easier squeezing against a cleaner formation face.

As in any squeeze job, the packer used in gas treatments should be seated in a hard and competent formation which is free from fractures. Such packer seats can usually be picked from knowledge of drilling time and formation samples.

Finding the water zone . . . Locating the formation which is producing

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WATER SHUTOFF

"Silicon tetrafluoride treatment requires less time than some other water-shutoff methods."

water isn't always easy; still, the more closely the water-producing zone can be located and isolated, the better the chances of success of a gas squeeze and the cheaper the job.

In some wells, the water zone has been pinpointed by logs which show formation porosity. In others, possible water zones have been located by correlating with logs of nearby wells.

Squeeze jobs on long intervals (up to 500 ft.) have been successful, but these require greater amounts of the silicon tetrafluoride. The gas itself is relatively cheap in proportion to the major expense item—rig time. Still, there is a saving to be made in keeping gas volume low and there is insurance in squeezing only the water zone itself.

Actually, the silicon tetrafluoride treatment requires less rig time than some other water-shutoff methods. The gas acts instantly and drilling can be resumed without any waiting time.

Performing the job . . . After the decision has been made to squeeze a water zone, the hole is cleaned up as described previously, and the bit is pulled from the hole. If the packer is to be set in casing, either the inflatable type or the hook-wall may be used. In open hole, the inflatable packer is used. Not only single packers, but also straddle packers have been used successfully.

The packer is run into place but not set. Then, into the drill pipe is dumped an amount of diesel oil about equal to the amount of hole to be treated. This diesel oil serves as a flushing fluid to remove water from the pipe and from the hole. The silicon tetrafluoride gas reacts with water wherever the two mix and the idea is to prevent their mixing until the gas can be squeezed back into the formation.

With the diesel oil in the pipe, the silicon tetrafluoride is bled into the pipe. Amount of gas used varies according to the potential of the formation, its permeability, and other factors. Generally, from 3 to 30 lb. of the gas has been used for each foot of hole being treated.

The silicon tetrafluoride is followed by a chaser of either natural gas or air depending on which is available.

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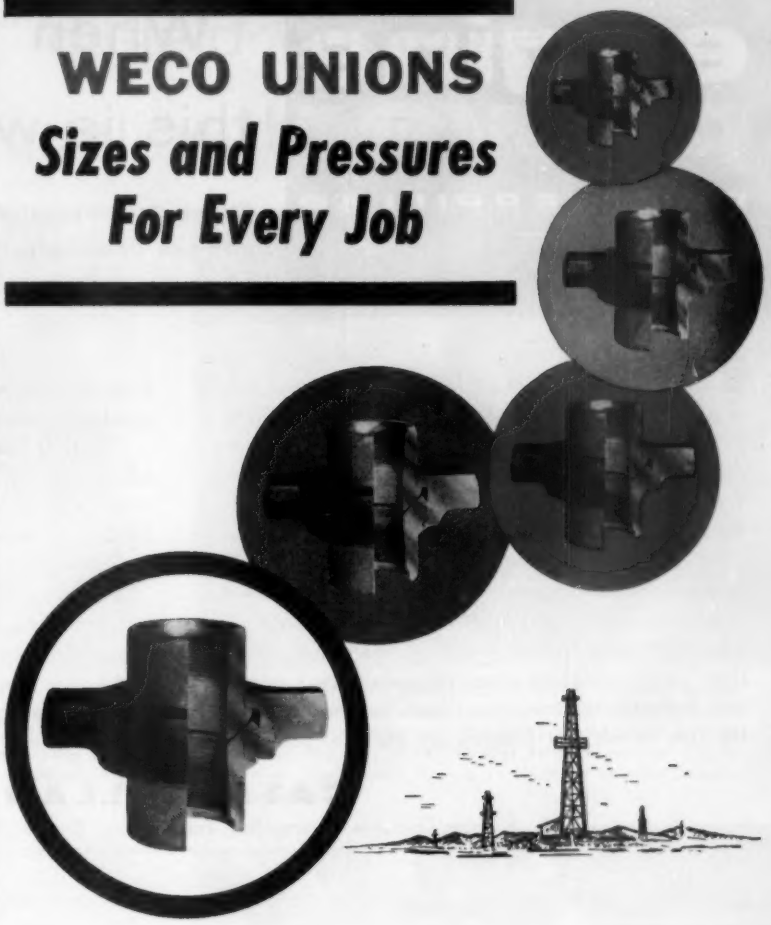

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Soundly engineered with a positive sealing ball and cone seat, the components of WECO Unions are correctly proportioned to provide maximum strength and union stability in every size.

WECO Unions have pressure ranges from 1,000 psi through 15,000 psi and are available from your nearest supply store.

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

engine power BY CATERPILLAR

When you build or this is what it means

These Continental-Emsco Drilling Tenders with 18 engines demonstrate the advantages of Cat power

Building *or* buying in-stock oilfield equipment, you get important advantages when the equipment has Cat Engine power throughout. Take these Drilling Tenders, built by Continental-Emsco Company, Dallas, Texas, for in-stock delivery. A total of 18 Cat Engines—from the compact D311 to the mighty D397—power them.

Cat Diesels have complete market acceptance. This is important to equipment builders—because the eventual buyer is the person who has created Caterpillar Engine acceptance. With Cat Engines and Electric Sets, there's no doubt about power dependability. Caterpillar and dependability are synonymous in oilfields throughout the free world. Cat Engines are built for heavy duty from the ground up. They aren't industrial versions of automotive-type diesels.

Parts and service availability is another Caterpillar advantage. Wherever Cat-powered, in-stock equipment goes in the free world, one of 840 Caterpillar Dealers is nearby with a complete parts and service organization.

When you build oilfield equipment—power with Cat Engines for easy selling. When you buy in-stock equipment and there's a choice of power—remember that Cat is *matched* to heavy-duty oilfield equipment.

Your Caterpillar Engine Specialist will give you answers to any oilfield equipment power question.

CATERPILLAR

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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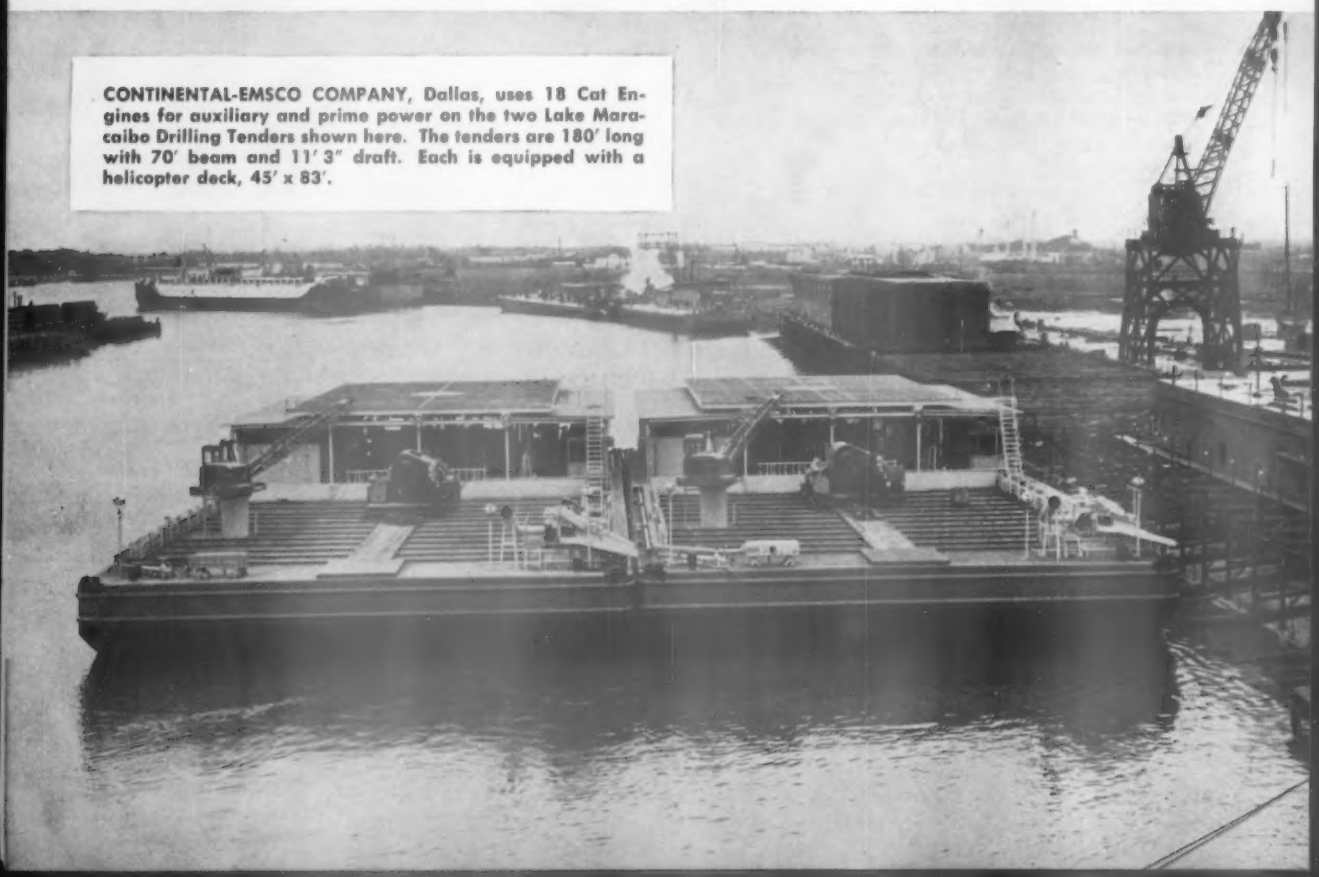
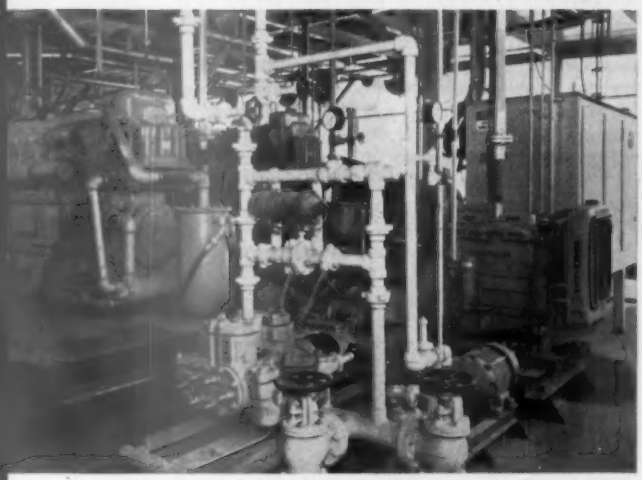
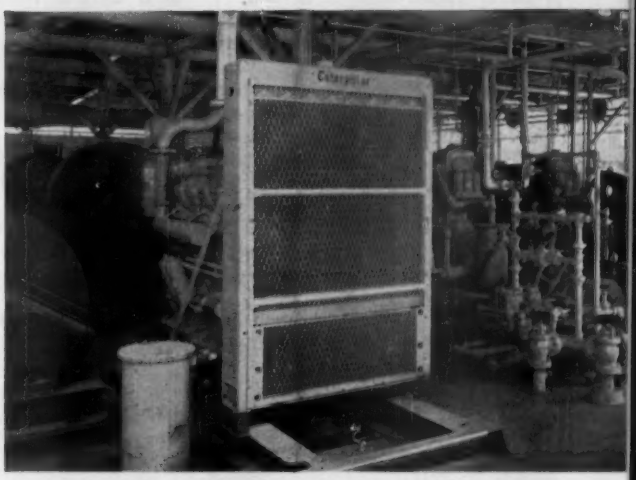


CONTINENTAL-EMSCO COMPANY, Dallas, uses 18 Cat Engines for auxiliary and prime power on the two Lake Maracaibo Drilling Tenders shown here. The tenders are 180′ long with 70′ beam and 11′ 3″ draft. Each is equipped with a helicopter deck, 45′ x 83′.

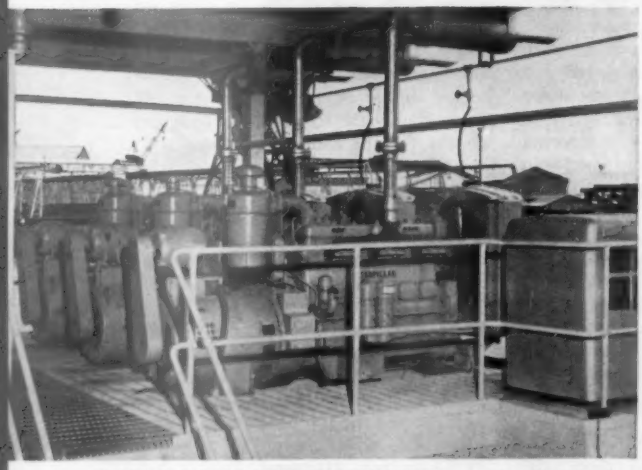
buy "in-stock" oilfield equipment to have top quality throughout



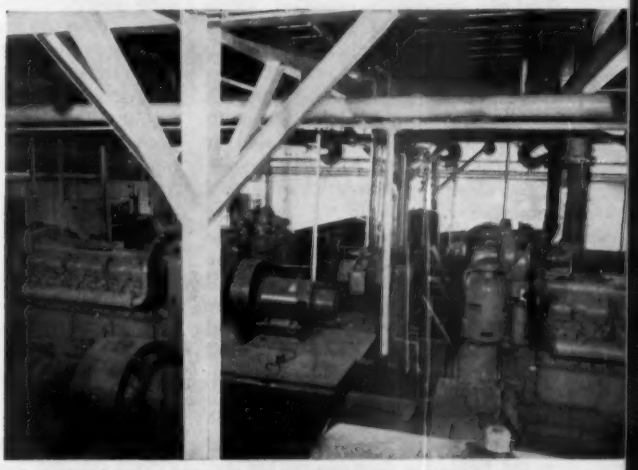
A MODERN, HEAVY-DUTY CAT D311 ENGINE (right) drives a Gardner-Denver FG-FXG 5" x 6" pump on each tender. These Cat-powered duplex pumps supply raw water for washing down rigs and keeping tenders clean. The D311 is rated at 65 HP. Other Caterpillar Engines range up to 650 HP (maximum output capacity).



HERE A CATERPILLAR DIESEL D375 ENGINE supplies power for a Gardner-Denver mud pump on each tender. Continental-Emsco Company finds the D375 an excellent power-match for the 7¼" x 14" Model FK-FXK pump. Every Caterpillar Engine and Electric Set is built to meet heavy-duty demands.



THREE CAT D318 DIESEL ELECTRIC SETS provide all A.C. electric power for each tender. Uses include excitation for the D.C. rig drive equipment, the generator and motor blowers, mud mixers, water and fuel pumps, and lighting for rig and living quarters.

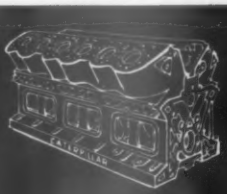


FOUR TURBOCHARGED CAT D397 DIESEL ENGINES drive Continental-Emsco "Del Lago" type compounding transmissions on each tender. The rigs, intended for service on Lake Maracaibo, Venezuela, have a drilling depth of 12,000 to 15,000'.

Caterpillar's own foundry casts engine blocks of a special high-tensile strength alloy, 50% stronger than ordinary gray iron castings. Numerous ribs and partitions provide further strength.

LOW FUEL COST. Caterpillar Engines don't require expensive diesel fuels, work fine without clogging even with No. 2 furnace oil. They burn fuel more completely, to save you money.

Honest horsepower. Your engine comes with a notarized certificate of power backed by Caterpillar Tractor Co. You get what you're promised.



"After squeeze job, drilling can continue without pulling pipe."

If neither is available at sufficient pressure, bottled nitrogen is used.

On deeper squeeze jobs, it is sometimes necessary to put a water column in the drill pipe to get enough hydrostatic head to squeeze the formation. If so, the silicon tetrafluoride is followed by a blanket of air or natural gas and then by a cementing plug. Then, a small volume of diesel oil (say, 2 bbl.) is placed atop the plug and the water follows that. The buffer of diesel oil and the plug prevent mixing of the silicon tetrafluoride and the water above.

With these materials in the drill pipe, the packer is rotated; rotation first sets the packer and then opens ports through which the squeeze materials are forced out. Pressure on the surface is then brought up to that necessary to get the silicon tetrafluoride into the formation without causing fracturing.

The annulus is left open at the surface so that any leakage past the packer may be detected.

When squeeze pressure has been reached, the well is shut in for a short time to make sure that the pressure holds.

Packers pulled . . . After squeeze pressure has been held for about 20 minutes, the pressure is released at the surface and the packer unseated. The drill pipe is pulled from the hole immediately.

No attempt is made to test the squeeze job with the packers in the hole. The reason is twofold. First it is not possible to calculate all the way to the bottom of the hole as it would be with a bit. And, second, with a bit on bottom, the hole can be dried up quicker because bit cuttings have an adsorbent effect.

Though it has not yet been used in the field, a collapsible packer has been designed for such squeezes in air and gas-drilled holes. This packer is intended to run collapsed in the drill string during drilling. When water is encountered, the packer can be inflated without pulling the pipe from the hole.

After the squeeze job, drilling can continue without pulling the pipe.

However, the nature of this new tool is such that it requires a pump truck on the well to inflate the packer. This fact will certainly influence the decision about whether the new packer will be used on any particular job.

Figuring displacement . . . One of the most difficult things about performing a silicon tetrafluoride squeeze is in calculating the displacement of the gas in the pipe. This displacement problem is complicated by the fact that the silicon tetrafluoride is chased by a second gas—either natural gas or air. Sometimes, all three gases are present in the pipe.

Temperature of the gases in the drill string varies with depth. Moreover, the gravity head on the gas increases with depth. Thus, a pound of the gas at 1,000 ft. doesn't occupy the same volume as it does at 5,000 ft.

Thus far, the solution has been in using the estimated average temperature and average gravity head on the gases. Then, injecting a small excess of silicon tetrafluoride adds a measure of safety. Success of these calculations is borne out in field jobs; on treatments where calculations showed gas had been displaced, little or no silicon tetrafluoride returned to the surface. On treatments where calculations showed that not all gas had been displaced, there would usually be a substantial amount returned.

In only two jobs was it apparent that the gas was overdisplaced into the formation. Both jobs were in formations where previous treatments had been unsuccessful. Likely, the formations were fractured or contained solution channels and no amount of silicon tetrafluoride would have resulted in reaching a squeeze pressure or in shutting off water production.

Weight of the silicon tetrafluoride can be measured directly by weighing the cylinders in which it is transported. Or, it can be calculated from the pressure in the cylinders before and after use.

Finding squeeze pressure . . . In completing oil and gas wells, most engineers use a figure of about 0.74 psi. per foot of depth as the pressure at which a formation may be expected to fracture. However, in squeezing with air and gas, formations have consistently fractured at pressures lower than this value would indicate.

In water-shutoff jobs, as a result, it has been necessary to keep squeeze pressures below 0.60 or 0.65 psi. per foot of depth. Otherwise, the water zone might be fractured and shutoff become impossible.

Even with squeeze pressures in the range of 0.60 psi. per foot of depth, the gas appears to penetrate far enough to plug water formations effectively. In laboratory tests, cores which had been penetrated to a depth of 4 in. by silicon tetrafluoride then could withstand a differential pressure of 4,000 psi. without failing.

However, reaching a squeeze pressure is not a sure indicator that the job is successful. There appears to be no means of knowing if water is shut off until the bit is back on bottom and the hole has been dried up.

Long performance . . . The well, mentioned earlier, in which drilling continued without water for 2 weeks after a shutoff job is in Puckett field of Pecos County, Texas. The contractor on the well had chosen to use gas drilling although he was drilling on a footage rate.

The well was drilled dry after leaving the casing at approximately 5,600 ft. First indication of water was at about 5,960 ft. For the next 200 ft., the well was "slug" drilled; i.e., slugs of foaming agent and water were injected from time to time to clean up the hole.

At about 6,200 ft. the water persisted and it was decided that an attempt should be made to shut it off if drilling were to continue to great depths. So, the zone was isolated with straddle packers and squeezed with silicon tetrafluoride.

After the job, the well continued drilling for 2 weeks and reached a depth of 12,500 ft. with no further traces of water.

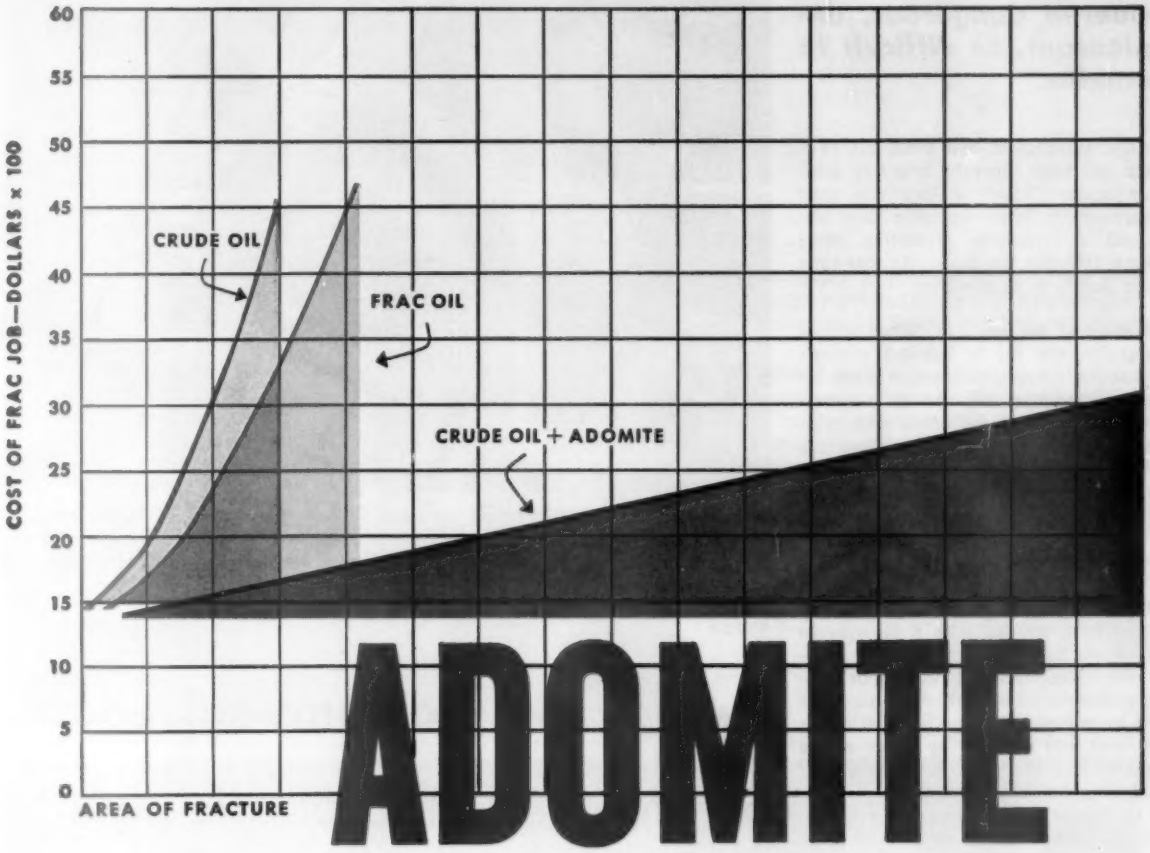
Long hole squeeze . . . The longest section of open hole squeezed thus far was in a well in Triple N field of Andrews County, Texas. When the well entered the top of the San Andres formation, water began to show up in the returns. However, drilling continued to the bottom of the formation, some 500 ft. below, where a second zone of water entry was drilled.

When the entire section had been opened, gross water production was about 60 bbl. per hour.

Drilling could not continue economically with air. For that reason, the entire 500-ft. interval was squeezed in a single stage. During the job (an early one), there was a sudden and substantial drop in pressure at the wellhead; it was apparent that the formation had been fractured.

In spite of the apparent fracture,

If you lose the fluid you're losing money!



stops fluid loss, gives more fracture at lower costs!

In job after job, producers find ADOMITE is the answer to larger fractures, lower costs per area, and greater yields. As the chart above illustrates, ADOMITE stops fluid loss, giving you more fracture extension. This is the kind of dollar-and-cents value economy-minded producers look for. The larger areas fractured could not have been obtained without ADOMITE in the fracturing fluid. Remember . . . fluid *lost* in the formation does *not* extend the fracture. In order to maintain *effective* working fluid, you need ADOMITE.

Why not find out what ADOMITE can mean to you? We'll be glad to perform fluid-loss control tests in your area to show you how to get the most from your fracturing fluid. For your next fracture or refracture job, specify ADOMITE through your service company.

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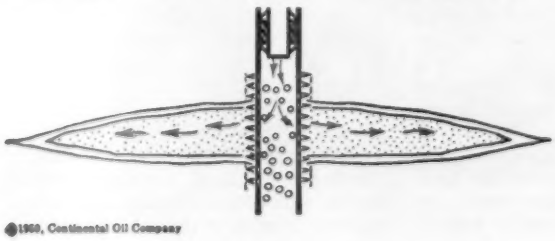

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ADOMITE®

. . . the additive for fracturing

"The gas is not considered dangerous, unpleasant, or difficult to handle."

water production had been cut to 6 bbl. per hour when the hole was dried up again. "Mist" drilling was used successfully until the hole later entered a formation producing more than 100 bbl. per hour. At that time the hole was mudded up.

Nature of the gas . . . When silicon tetrafluoride gas is bubbled through water, it forms a precipitate made up of a complex mixture of siliceous solids. These solids form a thick gelatinous mass. While this precipitate has little physical strength, it can be enough to plug the tiny pore spaces in water-bearing rock.

The gas is available commercially and is purchased in 84-lb. gas bottles. When breathed, silicon tetrafluoride is extremely unpleasant. But those who have worked with it on squeeze jobs do not consider the gas especially dangerous, difficult, or unpleasant to handle. It does not have to be pumped during a job, but rather is bled into the hole by virtue of the pressure in the gas bottles. If it must be reversed out of the well following a squeeze, it can be deactivated by bubbling through water. For these reasons, there is little occasion for spillage.

When the gas is squeezed into a water formation, it is preceded by a buffer of diesel oil which clears water from the hole and from the rock immediately around the well bore. When the silicon tetrafluoride arrives, it reacts immediately with the remaining water and pushes on through the oil to react with the formtion water farther back.

Even though the interval squeezed is made up of layers of different porosities and permeabilities, the result is likely a uniform plug in all strata. Of course, the gas penetrates the most permeable sands first, but it also plugs these first. Thus, the gas is continuously diverted to the next most permeable zone as it plugs first one and then the other.

When final squeeze pressure is reached and held, the gas should have penetrated into every zone permeable enough to produce water.

Because the reaction is back into the rock away from the formation face, ordinary drilling operations performed later will not knock loose the seal.

LINE FROM CHLORINATOR to suction basin of a cooling tower is 200 ft. long, with pipe supports 22 ft. apart. Plastic-coated steel pipe provides necessary strength and corrosion resistance. (Photo courtesy Jones & Laughlin Steel Corp.)

Two piping problems solved by steel-jacketed plastic pipe

STEEL - JACKETED polyvinyl-chloride (PVC) pipe has solved two piping problems at the Port Arthur, Tex., refinery of Texaco Inc.

In one application, it was necessary to run a 2-in. line from a chlorinator unit 200 ft. to the suction basin of the cooling tower for a naphtha stabilizer. This line carries a 0.05% chlorine-in-water solution to "shock" treat the cooling water and prevent algae formation.

Because the chlorine solution is fed through the line only at infrequent intervals, and because there are no facilities to purge the line, corrosion-resistant PVC pipe was called for. But, plastic pipe of that diameter lacks sufficient strength to span the 22-ft. spaces between support trusses of an existing pipe bridge parallel to the cooling tower. To use plastic pipe, a separate structure, with supporting crossmembers on 4-ft. centers, would have been required.

The other application is similar, except that the chlorine-in-water solution is piped underground some 200 ft. from another chlorinator unit to the refinery's No. 3 power plant. This pipe had to be buried in soft unstable earth, a condition that prohibited the use of standard PVC pipe because it would have been subject to crushing.

Texaco engineers overcome both of these problems by specifying the use of a special type of steel-jacketed PVC pipe. Plastic pipe with 0.065-in. wall thickness is bonded mechanically to the interior of electric resistance-welded carbon-steel pipe with a 0.120-in. wall. A groove rolled in each of the 20-ft. lengths accommodates Victaulic and similar types of couplings.

No special problems of temperature or pressure were encountered in the Texaco applications, although the pipe can handle liquids and gases at pressures up to 1,000 psi. and temperatures up to 150° F.

When the pipe was installed underground for the power plant service, it was coated and wrapped. Victaulic couplings were used. Standard 20-ft. lengths were coupled for the overhead pipe run adjacent to the cooling tower.

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GOLDEN SCREWS

To demonstrate to you that the exclusive two-screw design is practically worth its weight in gold all Worthington QD sheaves now have two golden screws.

The clamp screw simplifies installation and assures permanent alignment. You can install QD sheaves one part at a time. No heavy rim and hub combination to inch delicately into place. To change speed you simply install another sheave on the hub which remains anchored to the shaft.

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Neoprene products provide extra durability, long, dependable service. For example:

> Neoprene gaskets on crude oil storage tanks prevented leakage for 9 years. Ordinary rubber gaskets lasted only 6 months.
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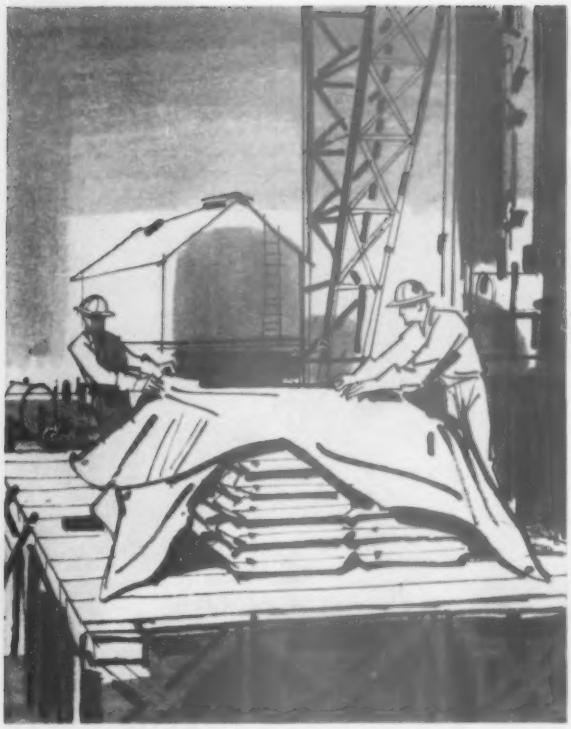
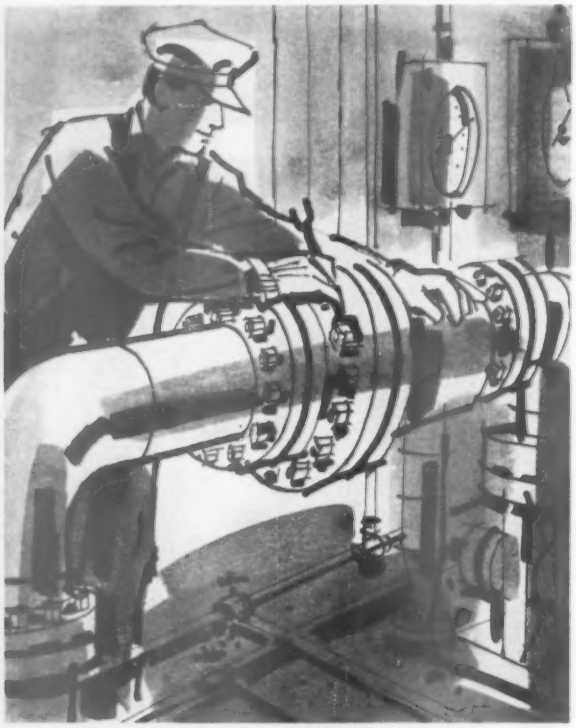
This means longer service per dollar, reduced replacement costs, minimum downtime.

Neoprene is a versatile synthetic rubber. It resists deterioration from oils and greases, most organic and inorganic chemicals. It is heat and weather resistant, will take tough, abrasive punishment, and will not support combustion.

Ask your supplier about neoprene the next time you order maintenance rubber goods for refinery, production and pipe line equipment. For additional information write for "Du Pont Elastomers in Industry," E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. OG-12, Wilmington 98, Delaware.



Neoprene coated nylon tarpaulins retain their flexibility and strength in all kinds of weather; they are lightweight and compact.



Gaskets of resilient Du Pont neoprene resist compression set, apply sustained pressure keeping joints tighter longer.

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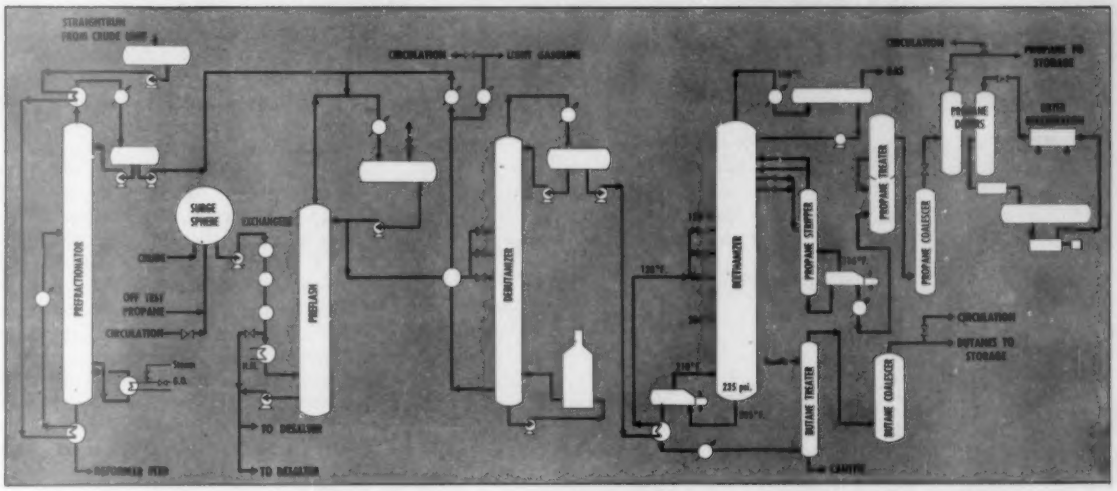
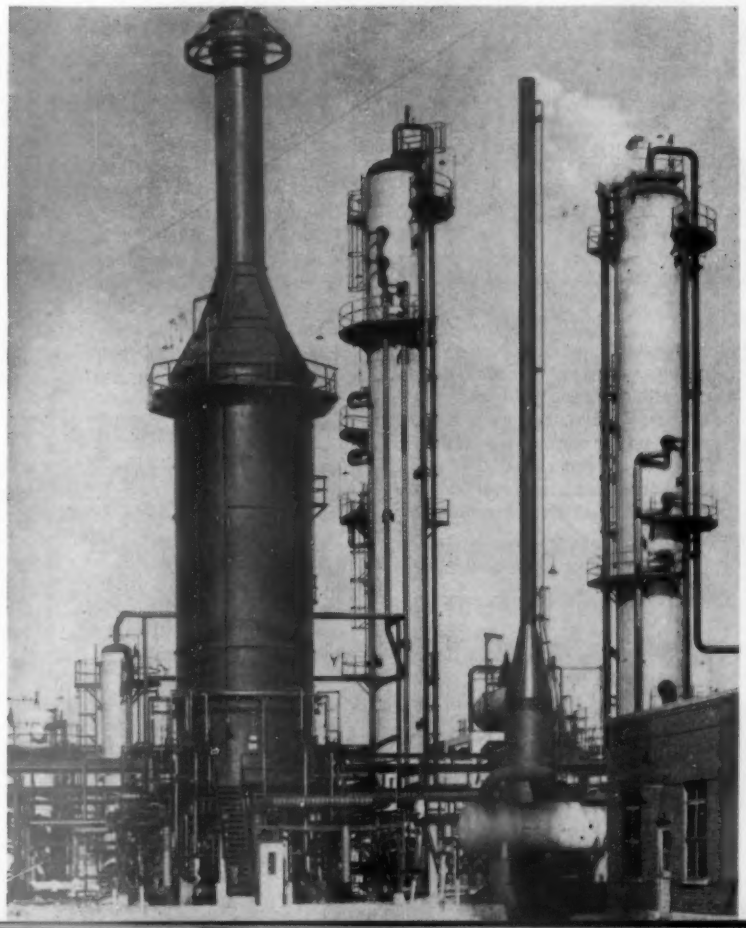


This flow diagram shows how Cities Service gets greater efficiency with a . . .

Double-duty deethanizer

The column also makes use of a propane sidestream



CRUDE stabilization unit uses, left to right, debutanizer reboiler, deethanizer, blowdown stack, and debutanizer.

A DEETHANIZER is serving double duty in a crude-stabilization unit at Cities Service Oil Co.'s East Chicago, Ind., refinery.

Ethane and lighter gases go overhead as is customary, but a butane product is coming off the bottom, and propane is withdrawn in a sidestream. A propane stripper removes light gases which come over with the propane.

The simplified installation, which eliminates the need for a separate propane tower, has been quite effective, producing specification-grade products. Product analysis runs better than 99% propane.

Incoming crude to the plant contains a high proportion of light ends. It is necessary to remove these in a stabilization unit prior to processing in crude-distillation equipment. The big separation takes place in a preflash tower whose bottoms are then charged to desalters as the first step prior to entering the crude units.

The light overhead stream from the preflash tower is combined with a

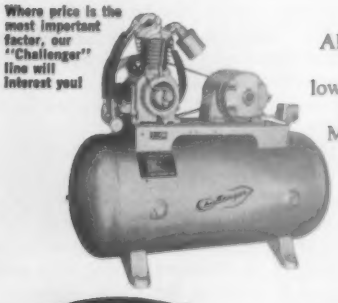
TABLE 1—PRODUCT ANALYSES (Vol. Per Cent)

Product	Method	Methane	Ethane	Propane	Isobutane	N-butane	Pentanes
Butane	Weathering	...	...	0	24	76	0
	Fractometer	...	...	0.7	18.83	80.32	0.15
Propane	Fractometer	...	0.1	99.4	0.4	0.1	...
Overhead gas		3.1	36.4	60.5	...	...	...

TABLE 2—DESIGN MATERIAL BALANCE
(Bbl. per day)

Product	Methane	Ethane	Propane	Isobutane	N-butane	Pentanes
Butane	...	...	51	1,213	4,657	23
Propane	...	16	6,190	40	...	...
Overhead gas	13	28	85	...	...	...

COMPRESSOR "DOWN TIME" CONQUERED!
THAT ♦!!♦?X● COMPRESSOR NO OIL IN THE CRANKCASE!
CHAMPION TO THE RESCUE!
WITH CHAMPION'S OIL MONITOR YOUR COMPRESSOR WON'T CYCLE IF CRANKCASE OIL IS LOW!
BOY! YOU MEAN NO MORE FROZEN PISTONS?
THIS CHAMPION COMPRESSOR WITH "OIL MONITOR" IS MY GOOD DEED FOR TODAY!



All kidding apart, Champion's *exclusive* Oil Monitor does save a lot of trouble due to low crankcase oil level in compressors. If oil level falls below the danger point, the Oil Monitor prevents the compressor recycling until oil has been added. There is a manual switch that overrides the Oil Monitor in emergencies.

Oil Monitor is standard equipment on all "Champion" compressors.

Write today for complete catalog.

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PNEUMATIC MACHINERY CO.
810 North Pleasant Street • Princeton, Illinois

light stream from a straightrun prefractionator and charged to the stabilization-unit debutanizer. Bottoms from this tower are recirculated and enter the light-gasoline pool. Overhead serves as charge to the double-duty deethanizer.

The deethanizer is a 93-ft. tower with an 8-ft. diameter. It contains 40 Koch Flexitrays. Feed enters on one or a combination of three trays, Nos. 19, 22, and 26, numbering from the bottom. The overhead stream enters an accumulator from where ethane and lighter is pulled off to an absorption unit. This amounts to an equivalent of 126 bbl. per day of charge. Accumulator liquid serves as reflux at the rate of 15,000 bbl. per day, entering above the fortieth tray.

Sidestream . . . Several drawoff trays are available for pulling off the sidestream propane. Currently the C_3 stream is withdrawn on tray No. 34 and charged to the top of the stripper. This is a 28-ft. tower with a 4-ft. diameter, containing 10 trays. Main purpose of this stripper is to drive off light gas in the propane stream and this is done by reboiling the stripper bottoms.

A gas-oil reboiler is used, with the gas-oil heated to 540° F. The bottoms are recirculated through the reboiler and propane product removed from this vessel. Vapors from the stripper are returned to the deethanizer tower on trays 35 and 37. About 6,200 bbl. of propane are produced daily off this stripper. Butane bottoms off the deethanizer, meanwhile, are treated and sent to storage.

The stripper's operation in the unit is not primarily to improve the fractionation process. Rather its main function is to remove the light gases which contain H_2S. Operations were conducted without its being used and salable products were obtained in this manner. However, H_2S concentrations in the product were too high under these conditions and the stripper is now operated as an integral part of the unit.

Treating . . . The propane is caustic treated and dried before being sent to storage. Some slight modifications in this section have improved operations and are mentioned here in passing. Initially, the control valve governing the rate of flow was located upstream of the treater. It is now located downstream, for when tanks were switched in operation of the treater, caustic would be lost. Now the pressure on the system is held across the treater itself and its operations are conducted entirely under system pressure. To improve contact

hē′li-ŭm

When you consider Helium-Recovery you will automatically think of Stearns-Roger.

Most of the operating helium plants in the free world have been built by Stearns-Roger. In this one organization is collected the cryogenic knowledge, experience and practical background to engineer and construct economical and satisfactory helium plants.

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on the treater a caustic circulating pump was installed. The initial arrangement, using a distributor at the bottom was inefficient and not enough contact was effected.

Quality . . . Product analyses of the butanes are normally run by weathering tests while vapor fractometer checks are made on the propane. However, some butane analyses were made with the fractometer and these results are shown in Table 1, along with analyses of the propane product and residue gas stream. The separations being achieved by the deethanizer are quite effective as seen in the analyses. Total butanes recovered as well as propane were both over 99%.

A comparison can be made by checking the analyses against the design material balance across the deethanizer as shown in Table 2. Propane content of the stripper product was set at 99.1. Total butanes in the bottoms product were calculated to run 98.9%.

Acknowledgments . . . Cooperation of the management of Cities Service Oil Co. in the release of this information and the assistance of H. O. Davis and Martin Symoniak in compilation of data are gratefully acknowledged.

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These two new curing agents provide controlled reactivity, require no heat to effect curing, are not adversely affected by high humidity and, when used with a liquid resin base, do not present a fire hazard.

Prior to this development the liquid epoxy base and the curing agent either had to be mixed in small batches having a usable life of only 15 to 20 minutes, or required complex special spray equipment which metered the components and mixed them just prior to atomization. Now large batches may be mixed which have far longer usable working life so that ordinary spray guns may be used without danger of being clogged.

Use of the new hardeners with solvent-type coatings based on higher-molecular-weight resins will provide a usable pot life of several weeks compared with a life of about 1 day when previously available curing agents are used.

Another interesting feature of the new curing agents is their superior performance in damp atmosphere. Coatings cured with most conventional curing agents show a severe blush or frosting when applied under conditions of high humidity. Coatings using the new agents show practically no blush even when applied under these conditions.

The excellent chemical resistance of high-build, solventless, epoxy-resin coatings has long been known. With the new curing agents it is possible to apply single coats up to 10 mils thick without bubbling or sagging from a vertical surface, thus eliminating the added expense and bother of multicoat applications.

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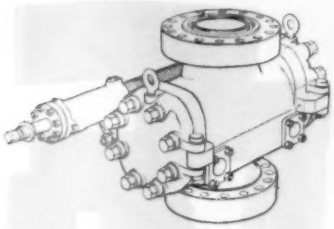

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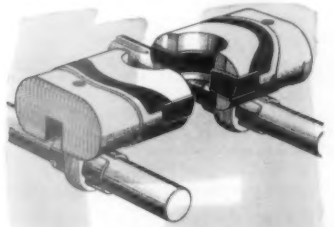

Ram actuator shafts rotate — are sealed at both ends to produce pressure balance for extra-easy operation.

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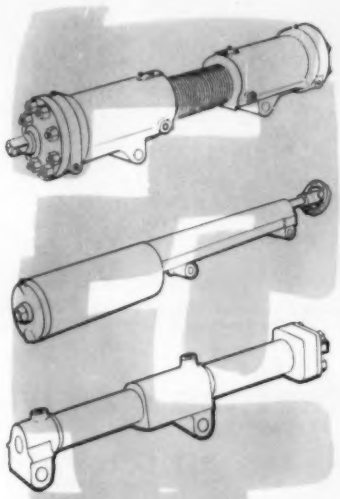

Type "F" Preventers are available with interchangeable operators for hydraulic, air or manual service.

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Early in our history as a company it became obvious that intermittent design work cannot meet the rush toward greater depths and higher pressures. As a result, we have always been ready with equipment to handle each new drilling requirement.

Close and continuous observation of pressure problems in drilling has shown that the best Blowout Preventer is the only bargain. This is the reason we say ". . . with so much at stake, don't take chances, take Cameron every time."

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Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 78 Grosvenor St., London W. 1 England.

At one time, grease used in wheel bearings of supersonic jet planes would melt during landings—would even catch fire! Now this has been solved by a revolutionary new grease developed by Standard Oil research.

When a jet lands, wheel bearings undergo temperature changes from —40° up to 450°. Above, Dr. Richard H. Leet, who helped design a grease that could withstand such punishment, is shown working in the Standard Oil research laboratory.

Rockets and missiles have moving parts that must be lubricated at temperatures from —65° to 450°. Another special Standard Oil grease can do this job without breaking down.

Meet the man who put the grease in *greased lightning!*

When men started probing into space and flying at speeds faster than sound, they met a new and baffling lubrication problem.

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Lubrication experts in the research laboratories of Standard Oil, headed by Dr. Richard H. Leet, had foreseen the need for such a grease. And when America's future jet growth hinged on the development of a revolutionary new grease, it was ready—as the result of a five-year research project.

Because of the unique qualities and great versatility of this new grease, it is also being used in industry, serving more efficiently and more economically than previous greases under conditions of extreme heat and extreme cold.

It is another example of a major contribution to progress from Standard Oil's research laboratories. Other examples of the same thorough and painstaking research are the gasolines and oils millions of motorists buy daily at Standard service stations throughout the Midwest and Rocky Mountain region.

What Makes A Company A Good Citizen?

One gauge is a company's usefulness...its contribution to the general welfare. Through research, Standard constantly strives to develop products that will strengthen America's defenses and help millions of people in their work, in their homes, and on the road—today and in the future.

1959

STANDARD OIL COMPANY
(INDIANA)

STANDARD

THE SIGN OF PROGRESS...
THROUGH RESEARCH

Chemicals used for various processes and products

(Approximate)

BY W. L. NELSON
Technical Editor and Petroleum Consultant

	Requirements	Price (approx.) (cts./lb.)	Reference
Additives, distillate and diesel:			
Antiscreen clogging, antirust, anticorrosion and inhibitors	20-35 lb./1,000 bbl.	41.6 (1955)	(1)
Cetane improvers	0.1-0.3% or 2,500 p.p.m.	30.0 (1955)	(1), (2)
Corrosion inhibitor	50 p.p.m.		(2)
Combustion improver (heating oil)	50 p.p.m.		(2)
Stabilizer	100 p.p.m.		(2)
Additives, gasoline or jet fuel:			
Antioxidants	2-16 lb./1,000 bbl. or 20 p.p.m.	117 (1955)	(1), (2)
Antiknock	Up to 4 ml. fluid per gal.	0.218 ct. per ml.	(1956)
Anti-icing	½-1% or 11,000 p.p.m.	5.25 (1955)	(1), (2)
Corrosion inhibitor (gasoline)	10-50 p.p.m.	20 (1955)	(1), (2)
Corrosion inhibitor (jet)	50 p.p.m.		(2)
Dyes and decolorizers	A few p.p.m. or 5 p.p.m.	100 (1955)	(1), (2)
Detergents	2,500 p.p.m.		(2)
Gum inhibitor	3-10 lb./1,000 bbl.		(5)
Metal deactivator	1-3 lb./1,000 bbl. or 4 p.p.m.	133 (1955)	(1), (2)
Preignition preventers	0.01-0.02%	37.5 (1955)	(1)
Upper-cylinder lubricants	0.1-0.3% or 2,500 p.p.m.	3.56 (1955)	(1), (2)
Additives, lubricants:			
Antioxidants (corrosion)	0.4-2.0%	20.7 (1955)	(1)
Antirust agents	0.1-1.0%		(1)
Detergents	2-10%	19.6 (1955)	(1)
Extreme-pressure agents	5-10%	23.3 (1955)	(1)
Defoamants	0.0002-0.07%		(1)
Odor control	0.001-0.005%		(1)
Oiliness imparters	0.1-1.0%		(1)
Pour depressants	0.1-1.0%	40 (1955)	(1)
Viscosity-index improvers (also pour)	0.5-10%	24 (1955)	(1)
Additives, residual fuel:			
Ash modifiers	500 p.p.m.		(2)
Sludge dispersant	Small		(2)
Alkylation (see Sulfuric or Hydrofluoric Acid)			
Aluminum chloride, Alchlor treating	0.6-0.15 lb./bbl.	16 (1956)	
Aluminum chloride, catalyst	0.01 lb./lb. product		(7)
Ammonia, topping-plant corrosion	0.003-0.03 lb./bbl.	4.25 (1956)	(9)
Ammonia, topping-plant corrosion	0.2 lb./bbl.		(5)
Bauxite, wax decolorizing	0.017-0.2 lb./lb. wax	3.0 (1956)	(9)
Benzol, MEK dewaxing	0.05-0.25 lb./bbl.		
Catalysts:			
Cracking	0.1-0.5 lb./bbl. reactor chg.		(3), (5)
Cracking	0.5 lb./bbl. feed.		(6)
Cracking, TCC makeup and loss	0.15-0.5 lb./bbl. feed	17 (1956)	(9)
Cracking, fluid makeup	0.2-0.6 lb./bbl. feed	6-17 (1956)	(9)
Cracking, fixed bed	0.1 lb./bbl.		(9)
Dehydrogenation (butadiene)	0.06-0.17 lb./gal. C_4H_8 (1941)	70 (1956)	(5)
Hydroforming, reforming	0.2-0.4 lb./bbl. feed (1941)		(5)
Hydroforming, reforming	0.1 lb./bbl. feed (1956)		(9)
Hydrofining, desulfurization	0.04 lb./bbl. feed (1956)		(8)
Isomerization:			
Butane (9-10% $AlCl_3$)	50-120 gal./lb. cata.		(9)
Butane, vapor phase	200 gal./lb. cata.		(9)
Butane	0.4 lb./bbl. isobutane (1941)		(5)
Polymerization:			
Solid acid	0.3-0.4 lb./bbl. product (1941)		(5)
Low pressure	10-50 gal./lb. cata.		(9)
Chamber	50-75 gal./lb. cata.		(9)
Reactor-type	120-150 gal./lb. cata.		(9)
Liquid phos. acid	140 gal./lb. acid	5.4 (1956)	(9)
Reforming:			
Thermofor chromia-alumina	0.2 lb./bbl.	70 (1956)	(6), (9)
Cycloversion (bauxite)	25-50 bbl./lb. bauxite		(6)
Chromia-molybdia	3-15 bbl./lb. cata.	110 (1956)	(6)
Platforming	60-250 bbl./lb. cata.	*710 (1956)	(9)
Platforming	25-100 bbl./lb. cata.		(6)
Other platinum catalyst	20-200 bbl./lb. cata.		(9)
Platinum lost permanently	0.5-1.5 ct./bbl. (1952)		(3)
Caustic soda (see Sodium Hydroxide)			
Chlorex, treating	0.25-0.5 lb./bbl.		
Clay:			
Neutralizing gasoline, kerosine, etc.	1-5 lb./bbl.	1.3 (1956)	(9)
Contact filtration	5-25% by wt. of oil		(9)
Contact filtration	15-80 lb./bbl.		(9)
Total usage	0.249 lb./bbl. crude (1937)		

(Continued on next page)

CHEMICALS USED FOR VARIOUS PROCESSES AND PRODUCTS (APPROXIMATELY) (Continued)

	Requirements	Price (approx.) (cts./lb.)	Reference
Total usage	0.180 lb./bbl. crude (1941)		
Total usage	0.191 lb./bbl. crude (1952)		
Clay, percolation:			
Lightest color oils	4-8 bbl./ton		(9)
Motor oils	8-21 bbl./ton		(9)
Darker oils	25 bbl./ton		(9)
MEK waxes	7-37 bbl./ton		(9)
Pressed and sweated waxes	32-147 bbl./ton		(9)
Propane and MEK waxes	105-331 bbl./ton		(9)
Centrifuge waxes	1.1-2.4 bbl./ton		(9)
Clay, vapor-phase treating	2,000-4,500 bbl./ton (1941)		(5)
Copper chloride treating	2.1-14 lb. chloride/1,000 bbl.	45 (1956)	(9), (10)
Copper chloride treating	116 lb. slurry/1,000 bbl.		(9)
Copper chloride treating	8.4 lb. clay/1,000 bbl.		(10)
Cracking (see Catalysts)			
Cresol, Duo Sol treating	0.3-0.45 lb./bbl.	13 (1956)	
Dehydrogenation (see Catalysts)			
Desulfurization, gas (DEA or MEA)	0.005 lb./lb. H_2S removed	24 (1956)	(3)
Desulfurization, gas	0.5-2 lb./M.M.c.f.		(9)
Furfural treating	0.35-0.5 lb./bbl.	12 (1956)	
Hydrofluoric acid, alkylation	0.7-1.5 lb./bbl. (1941)		(5)
Hydrofluoric acid, alkylation	0.42 lb./bbl. (1952)		(3)
Hydrofluoric acid, alkylation	0.3-0.8 lb./bbl. (1956)	17.9 (1956)	(9)
Isomerization (see Catalysts)			
Lime, thermal cracking neutralization	0.1-0.2 lb./bbl. fresh feed (1941)		(5)
Lime, thermal cracking neutralization	0.3-1.0 lb./bbl. fresh feed		(9)
Lime, thermal cracking neutralization (W.T.)	0.4-0.5 lb./bbl. fresh feed (1941)	0.63 (1956)	(5)
Litharge, doctor sweetening	0.1-0.5 lb./bbl. (1941)	22 (1956)	(5)
Methyl ethyl ketone dewaxing	0.17-0.25 lb./bbl.	14.5 (1956)	
Nitrobenzene treating	0.25-0.4 lb./bbl.	11 (1956)	
Polymerization (see Catalysts)			
Percolation (see Clay)			
Propane, deasphalting, dewaxing, etc.	0.5-0.75 lb./bbl.		
Phenol treating	0.35-0.5 lb./bbl.	15.5 (1956)	
Reforming (see Catalysts)			
Sodium carbonate (ash), neutralized after acid	1-3 lb./bbl.	1.5 (1956)	(9)
Sodium hydroxide:			
Total consumption	0.196 lb./bbl. crude (1930)		
Total consumption	0.157 lb./bbl. crude (1945)		
Total consumption	0.149 lb./bbl. crude (1956)	2.6 (1956)	
Neutralization in topping	0.04 lb./bbl. (1941)		(5)
Neutralization in topping	0.15-0.3% by vol., 10 Be.'		(9)
Sodium hydroxide, after acid treating:			
Cracked or high-sulfur gasoline	0.1-1.0 lb./bbl.		(3), (5)
Kerosine	1-3 lb./bbl.		(5)
Sodium Hydrochlorite		5.0 (1956)	
Sodium Tripolyphosphate		7.8 (1956)	
Sulfur dioxide, lube treating	0.1-0.2 lb./bbl.	4.5 (1956)	
Sulfuric acid, total consumption	1.33 lb./bbl. crude (1930)		
Sulfuric acid, total consumption	1.225 lb./bbl. crude (1945)		
Sulfuric acid, total consumption	1.245 lb./bbl. crude (1956)	1.12 (1956)	
Sulfuric acid, alkylation:			
If acid is recovered	4-17 lb./bbl.		(9)
Butenes or pentenes	42-84 lb./bbl. (1941)		(5)
Butenes or pentenes	42 lb./bbl. (1952)		(3)
Butenes or pentenes	25-80 lb./bbl. (1956)		(9)
Propylene	84-140 lb./bbl. (1956)		(9)
Sulfuric acid treating:			
Cracked or high-sulfur gasoline	0.33 lb./bbl. (1952)		(3)
Cracked or high-sulfur gasoline	1-10 lb./bbl. (1941)		(5)
High-sulfur straightrun gasoline	5 lb./bbl.		(9)
High-sulfur cracked gasoline	8 lb./bbl.		(9)
High-sulfur solvents	0-5 lb./bbl.		(9)
Kerosine	1-15 lb./bbl.		(9)
Kerosine	1-10 lb./bbl. (1941)		(5)
Lubes, lightest or neutrals	10 lb./bbl.		(9)
Lubes, dark colored	40 lb./bbl.		(9)
Toluene, in MEK dewaxing	0.15-0.2 lb./bbl.	5 (1956)	
Water-treating chemicals	0.09-0.13 lb./bbl. crude (1941)		(5)

*New catalyst $14.00 per lb., replacement $4.00 per lb.

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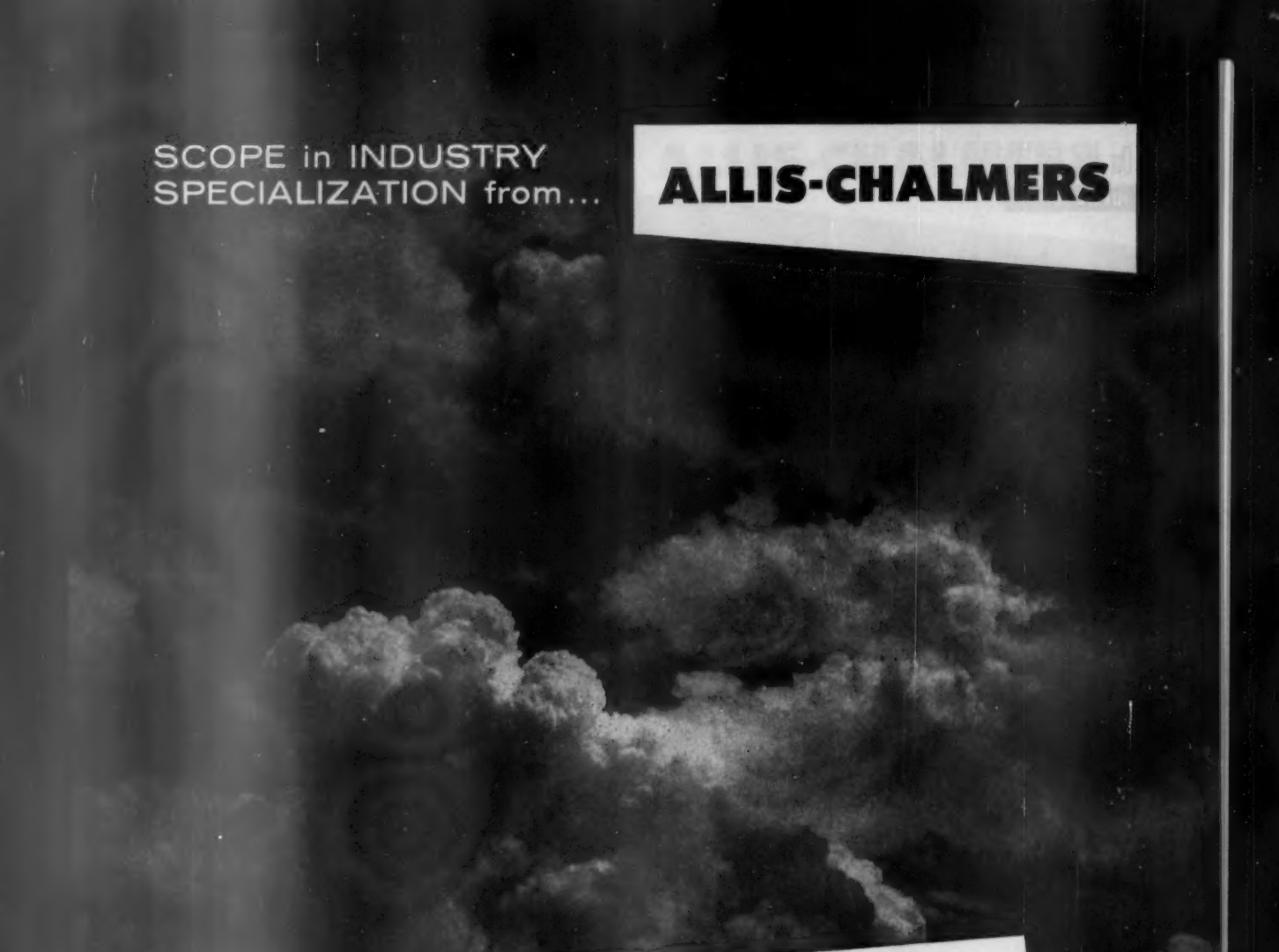

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On the Job

PIPELINING

Synthetic diaphragms cut p.d.-meter maintenance

BY M. P. DeBAETS
General Superintendent, Gas-Measurement Department, Ohio Fuel Gas Co., Columbus, Ohio

THE FREQUENT REPLACEMENT of leather diaphragms required in large-volume positive-displacement meters on gas wells, was formerly one of our main maintenance problems. More than 5 years ago, we installed a few meters with synthetic diaphragms.

It soon seemed that the synthetic diaphragms stood up better to the prevailing operating conditions. So we decided to conduct an extensive program of field and laboratory tests to check our random observations. Today, practically all our large-volume, high-pressure displacement meters, both on producing wells and on industrial service installations, are equipped with synthetic diaphragms.

The Columbus group of the Columbia gas system obtains about 10% of its gas supply from local wells. The Ohio Fuel Gas Co. operates about 2,500 wells and buys additional gas from independent producers. The average production per well is 15 to 25 M.c.f.d., but peak production on some wells may go up to almost 2 M.M.c.f.d. Average pressure on the wells is about 50 to 150 psi., with some wells having pressures somewhat higher.

Since local gas production in the Appalachian area has, of course, declined considerably since the days when this area was one of the nation's foremost gas-producing areas, we find that most of the local production today can best be measured by positive-displacement meters in capacities of 1,500, 2,500, and 5,000 cu. ft. per hour. When well production is greater than can be handled by positive-displacement meters, or when well operating pressures exceed 500 psi., usually orifice-meter measurement is established.

SYNTHETIC DIAPHRAGMS are used by Ohio fuel on large-volume displacement meters.

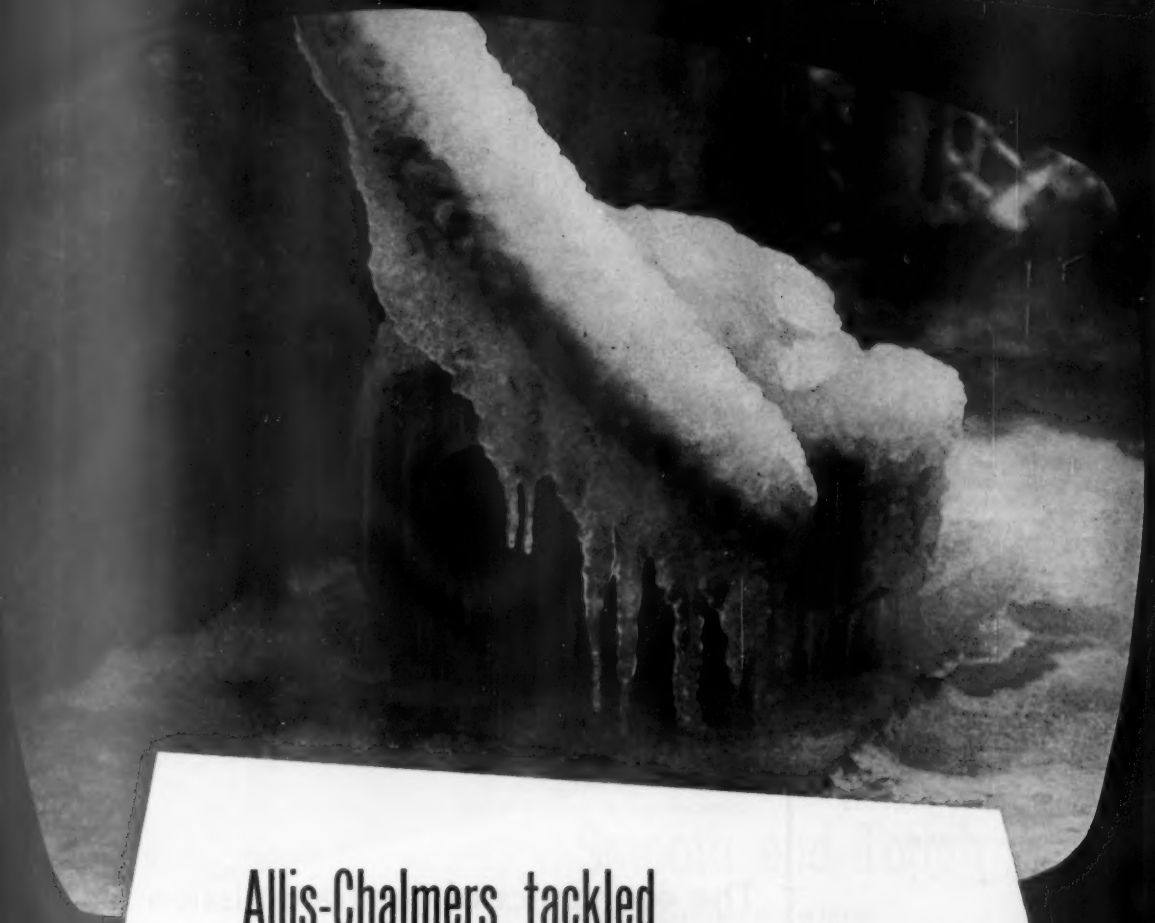
The gas-measurement department of our group is repsonsible for all large-volume meters operating above normal distribution ounce pressure. The department at present operates and calculates charts from approximately 4,300 meters. This total includes positive-displacement, rotary, and orifice meters. Besides using positive-displacement meters to meter local production, these meters are also used to measure industrial loads. In addition to the aforementioned-size meters, some industrial loads are measured with meters having up to 10-m.c.f. per hour capacity.

Before installation, all meters are shop-inspected and their accuracy verified. They are again tested at installation in the field with a flange-tap flow prover, using air as the testing medium, and retested 60 days later after a breaking-in period. During service they become due for test either at a predetermined index registration or after 2 years, whichever comes first. On producing wells, about 50% of the meters become due on the registration basis. On industrial installations, about 80% of the meters become due on the registration basis. Industrial demand generally tends to increase after installation until a maximum demand develops, while the flow of producing wells naturally tends to decrease as time goes on.

The main problems of producing wells are the impurities in the gas—crude oil, salt water, liquid hydrocarbons, gasoline vapors and fluids, etc. These impurities in the past would wash the oil out of leather diaphragms, making meter registration inaccurate. As a result, meter proof had to be continuously adjusted, and leather diaphragms were frequently replaced. Cold temperatures

SCOPE in MOTOR DEVELOPMENT from . . .

ALLIS-CHALMERS



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The successful tests were conducted in the A-C Motor Laboratories where customers' motor needs point the way to continuous development programs.

Research, combined with testing of this type, has established Allis-Chalmers as a pioneer-leader in the motor industry. It has led to the most complete line of integral-horsepower motors; it has led to tremendous acceptance of such A-C developments as *Synduction* and tube-type motors, and now *Super-Seal* motors.

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in winter would tend to aggravate the situation. Moreover, leather diaphragms were affected differently in different types of meters.

One of the meters installed in 1954 with Vulcan synthetic diaphragms was tested on the site in January 1955 and again in June 1955. The diaphragms in the meter had been exposed to considerable gasoline vapors and some gasoline fluid.

The black color of the synthetic-rubber coating had somewhat faded, and the fabric was slightly less pliable, but even after the second test, the meter proof was still correct. There was no evidence of fabric shrinkage or leakage. The meter also passed the "slow motion test" (checks for proper operation at extremely low flows). On the other hand, it would have been necessary to replace leather diaphragms perhaps several times at this location if we had used them through the winter instead of the synthetic diaphragms.

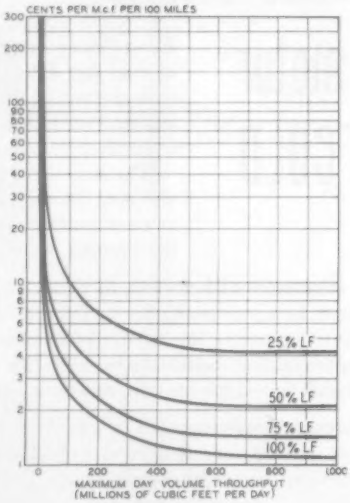
Similar test results from other locations induced us to begin a formal observation and testing program. We compared records of meters with synthetic diaphragms in the field. We were also interested in performance figures at low temperatures during the winter. Accelerated-use tests were also conducted under controlled conditions and also temperature tests in a cold box were made.

Results were coordinated and discussed with the other groups of the system through our Columbia system gas-measurement committee. We also compared notes with our distribution and service departments, which were conducting synthetic-diaphragm tests on meters operating at regular distribution pressures. Finally, we studied test results made available by manufacturers on effects of temperature on leather and synthetic diaphragms.

After full evaluation of all available test data through the Columbia system gas-measurement committee, we began to use this type of synthetic in all large-volume, high-pressure displacement meters on gas wells, industrial service, and for all other uses. Following our experience, our distribution department then also switched to synthetic diaphragms in large-volume industrial meters operating at normal distribution pressures.

We have drawn the following conclusions from our observations and tests: Synthetic diaphragms maintain proof longer in large-volume displacement meters. Synthetic diaphragms withstand the impurities contained in typical wellhead gas. They are also not affected by the odorant used in odorizing natural gas. They operate more accurately at low temperatures. They show less tendency to shrink and leak under severe operating conditions. Since synthetic diaphragms require no oil, conditioning, cleaning, and oiling of diaphragms on a maintenance schedule has been eliminated. Over-all substantial economies have been achieved through reduction in maintenance, reduction in testing, and through a lower rate of diaphragm replacements in these meters.

The economics of gas transmission



COSTS of gas transmission vary widely with load factor and volume throughput.

AN EFFECTIVE gas system must have a peak capacity far above its base load.

Capacity is expensive. Cost allocation affects the problem, but maximum use is the only sure path to lower average costs.

The following graph makes this point with great clarity.

This chart, which was prepared for Southern Counties Gas Co. of California by Bechtel Corp., shows the cost of transporting gas through a representative pipeline system in terms of cost per 100 miles at various throughputs and various load factors.

Interstate receipts of the Pacific Lighting system are now slightly more than one billion cubic feet per day. This volume can be put through an adequate pipeline at 100% load factor

From a paper by Dr. Cecil L. Dunn, manager of rate department, Southern Counties Gas Co. of California, at INGAA meeting, October 26, 1959, Phoenix.

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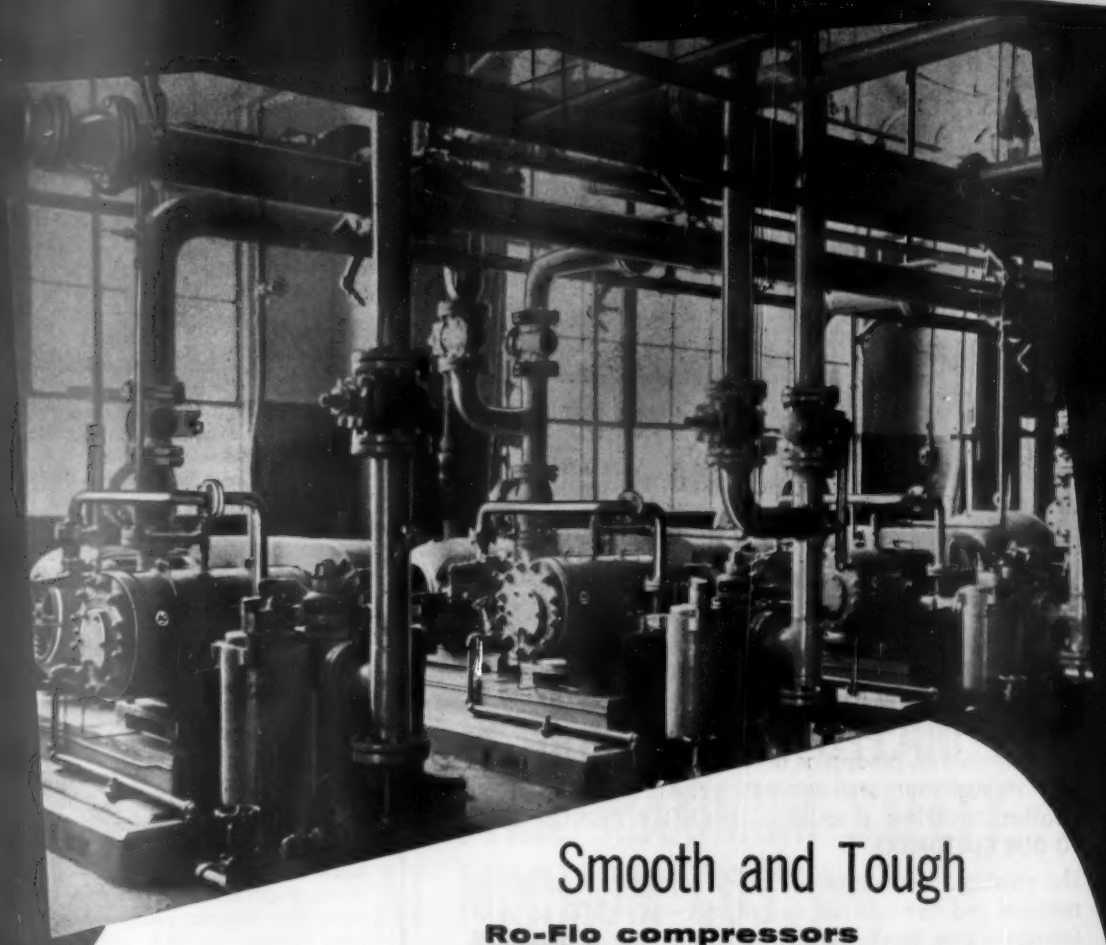

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for 1.1 cents per 100 miles. When the load factor falls, the costs rise thus:

Load factor	Transmission cost cents per 100 miles
75	1.4
50	2.1
25	4.2

Smaller systems experience parallel changes, for example, costs on a system designed to transport a maximum of 200 million cubic feet per day vary with load factor thus:

Load factor	Transmission cost cents per 100 miles
100	1.8
75	2.3
50	3.4
25	6.8

While it is obvious that a high-capacity line is more economical than one built to handle a smaller peak volume, the ratio of variation of cost with load factor is much greater.

At 100% load factor a billion feet can be transmitted 100 miles for 1.1 cents; cut the volume by a factor of 5, to 200 million feet and cost rises 62.5%, to 1.8 cents. But cut load factor by a factor of 4, to 25%, and what happens? On the billion-foot line the cost rises 300% to 4.2c, and on the 200-million-foot line it rises 276% to 6.8 cents.

These facts are patent, of course, to pipeline engineers, but to what extent have they been driven home in fixing the economic rationale of regulation? That question is hard to answer, because the pure logic of load factor is mixed in all regulatory questions with another consideration—by what devices is load factor maintained? When that question is raised we bite into the meat of the matter, competition and the anomalous application of regulated monopoly theory to an highly competitive industry.

Let us examine the relative economics of the two principal methods of maintaining load factor-storage and industrial sales.

Where operating conditions related, among other things, to an adequate interruptible market have permitted, line pack has largely supplanted aboveground storage. It remains, however, essentially a substitute for the older methods, and its usefulness is limited to short-period equation. Modern underground storage in natural structures is the only real alternative to interruptible deliveries insofar as load-factor maintenance on high-capacity long-distance pipelines is concened. A combination of interruptible sales with storage is often the most desirable arrangement.

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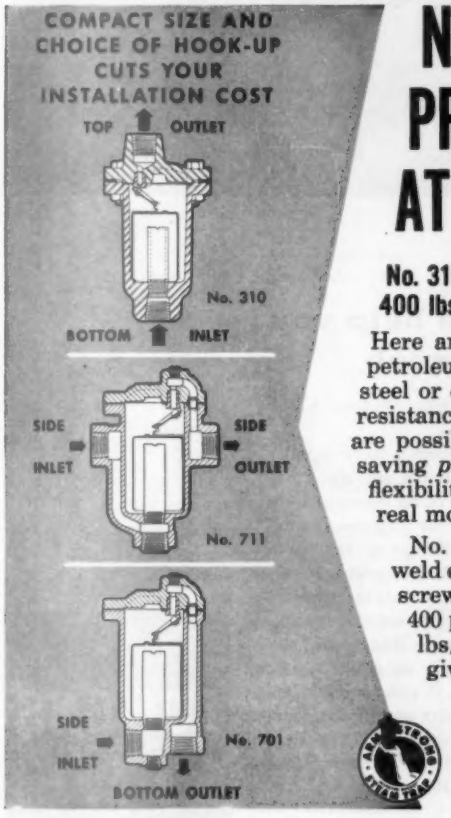

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No. 310 forged steel traps are available with screwed or socket weld connections, ½" or ¾"; Nos. 711 and 701 ductile iron traps with screwed connections, ½" or ¾". For working pressures up to 400 psig and capacity ranges from 700 lbs/hr. at 250 psig to 590 lbs/hr. at 400 psig. Your nearby Armstrong representative will give you complete information. Call him, or write:

SEND FOR CATALOG. 48 page Steam Trap Book gives complete information on Armstrong traps; includes selection, installation and maintenance data. Free on request.

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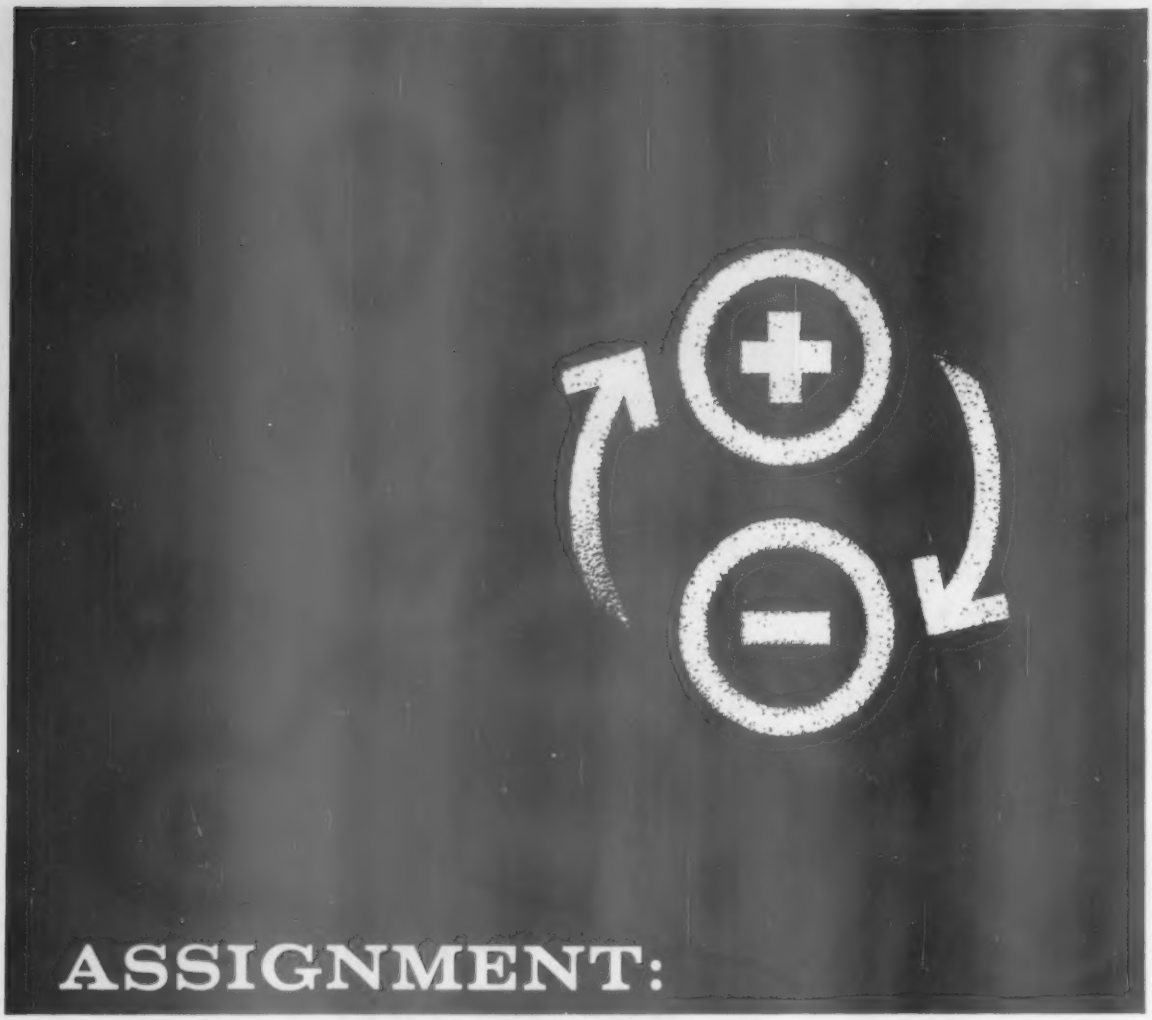


ASSIGNMENT: CORROSION

How Lukens *Application Research* can help you find the right steel plate for the job

Migrating ions—superimposed on a photomicrograph of corroded steel plate—symbolize one of metallurgy's oldest assignments: the battle against corrosion. Developing new tactics in this constant campaign is the job of our Application Engineering staff.

For example, called on early in the planning stages, Lukens engineers recently attacked almost identical problems for two large processing companies—and came up with two completely different solutions.

The first involved a sugar refiner's vacuum pans. Frequent and costly cleaning was required to head off corrosion and product contamination. Our staff's prior research and experience in the food equipment field led it to suggest *nickel*-clad steel for the pans. (13% and 8% nickel-clad on A-285 backing steel.)

Cleaning and maintenance were equally costly to a leading chemical and dye company—in the protection of its nitrogen solution barge tanks. Here, our engineers found *stainless*-clad steel the most desirable answer. (12% 304L on A-212 backing steel.)

Armed with practical as well as technical knowledge of Lukens' wide range of special-duty steels, our Application Engineers have helped conquer corrosion on many fronts. That's why we say . . . *if your assignment is corrosion, let it be our assignment, too.* Contact Manager, Application Engineering, P-129 Services Building, Lukens Steel Company, Coatesville, Pa.

Helping Industry Choose Steels That Fit The Job

LUKENS

ASK FOR THE BULLETIN ON LUKENS CLAD STEELS

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Vacuum lifter raises drums easily

. . . as well as other equipment. The Pad Pac unit is self-contained and offers a way to safely and efficiently handle barrels, concrete, sheet and plate steel, and other nonporous materials.

Measuring about 18 in. high, it is equipped with a 16-in.-diameter pad and a neoprene seal ring with a lifting capacity of 1,200 lb. in horizontal lift and 600 lb. in a shear position. Operated by a ⅓-hp. power unit attached directly to the pad, the machine comprises an electric motor, vacuum pump, filters, muffler, gage, check valves, etc.

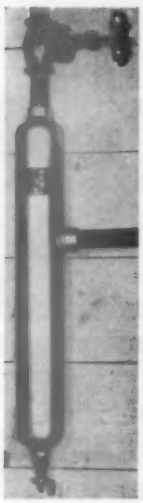
With a delivery time of about 1 week, the unit sells for about $695. Source: **Vac-U-Lift Co., Div. of Siegler Corp., Salem, Ill.**

Side-stream boiler-water control

. . . system that automatically keeps boiler water clear by eliminating sludge and suspended solids has been introduced. The new Filtrion control, developed for heating, process, and power boilers, continuously recirculates boiler water through a side-stream filter that reduces suspended solids to a value near zero. It combines and integrates this side-stream filtration with chemical pretreatment, internal treatment, continuous minimum blowdown and feed-water preheating, and degassing all in one completely automated unit.

The system is available in standardized models for all types of steam boilers up to 1,000 hp. and customized units for boilers up to 6,000 hp. Equipped with analyzing and sensing devices, safety and operating con-

Purifier for cleaning air and steam



. . . in lines up to 2 in. in size has been placed on the market. The new Model LCR purifier provides its own liquid storage so that a drainer isn't necessarily required. The unit is blown down periodically by means of a manually operated drain valve.

One of the principal uses of the purifier is in compressed-air systems where it is installed immediately ahead of controllers, vibrators, drills, blowers, and other air-operated equipment. In this case, the purifier removes moisture which forms downstream from the aftercoolers, thereby assuring a clean supply of air that won't rust or impair the efficiency of the air-tool operation.

Body construction is forged steel with stainless centrifugal elements. Inlet and outlet connections are standard IPS. Units are designed for applications up to 400-psig. service and 500° F. temperature. Delivery time is from 3 to 4 weeks, and prices range from $31 to $85. Source: **V. D. Anderson Co., 1935 West Ninty-Sixth Street, Cleveland 2.**

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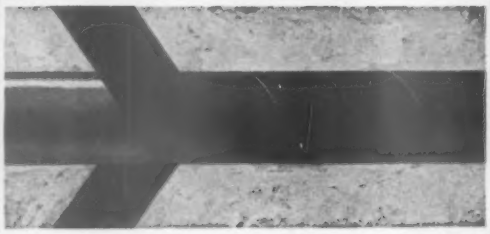

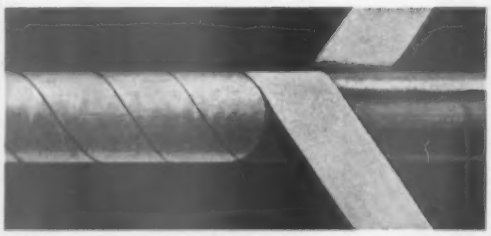

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trols, the system can be integrated with existing pretreatment systems.

The unit, which can be delivered in 8 weeks, weighs 3,500 lb. and measures 130 by 48 by 125 in. Price range is from $3,500 for the 150-hp. unit, to $8,500 for 1,000 hp. Source: **Sparkler - Filtrion Corp., Twenty-Fourth and Commonwealth Avenue, North Chicago, Ill.**

●

Holiday detector carries easily

. . . from the shoulder while inspecting coated surfaces of pipelines. This Model E-4 detector can be used through a day's inspection of coated pipe or other coated surfaces without recharging the battery. The maker says any coated surface with high electrical resistance can be quickly and accurately inspected for voids, pin holes, breaks, and scratches with the instrument. The voltage adjusts from 8,000 to 20,000 volts.

The 16½-lb. shoulder pack contains in separate compartments the battery and instrument assembly. Both are easy to get to for maintenance. Just remove four screws. Delivery time is about 1 week. Price is about $495. Source: **Tinker & Rasor, Box 281, San Gabriel, Calif.**

●

Nut prevents threaded-joint leaks

. . . on piping for hydraulic fluid, water, and process fluids. The Tef-Seal nut is installed with the usual fittings on pine connections. It can also serve as a substitute for straight-thread O-ring boss fittings using original female pipe ports.

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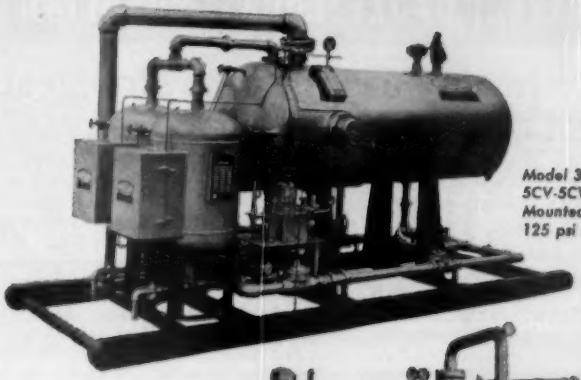
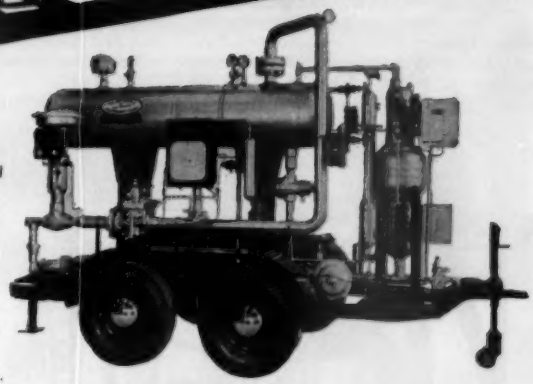


Model 30WT-0106S—5CV-5CV Skid Mounted Well Tester, 125 psi W.P.



Model 20WT-1407T—2½FV Trailer Mounted Well Tester, 1440 psi W.P.

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METROL Well Testers are oil and gas separators with oil, gas, and/or water meters piped on them for separating and measuring production from oil and gas wells. Sizes available are 16, 24, 30, 36, 48, 60, and 72-inch diameter with 6′ to 20′ shell lengths in 125, 300, 600, 1200, 1500, 2000, 2400, and 3000 psi W.P. These units will handle from zero to 20,000 BPD.

Available in both skid and trailer mounted models and in both two phase (liquid and gas) and three phase (oil, gas, and water).

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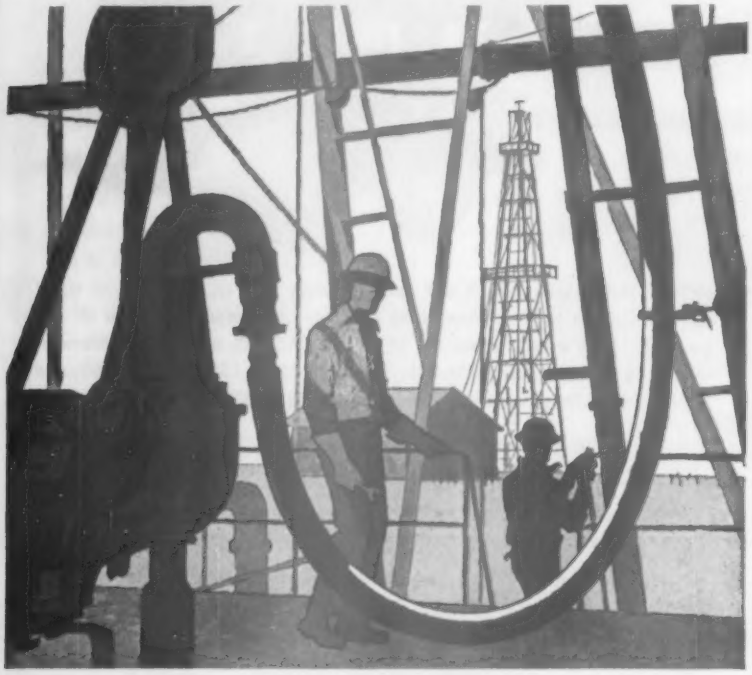

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The nut is made of steel with an insert of molded Teflon. It's designed for operating pressures up to 3,000 psi. and temperatures from —100° to 500° F. It comes in nine sizes from ⅛ to 2 in. Available for immediate delivery, its price ranges from about 20 to 94 cents. Source: **Weatherhead Co., 128 Washington Boulevard, Fort Wayne, Ind.**

●

Grease-worker speed is variable

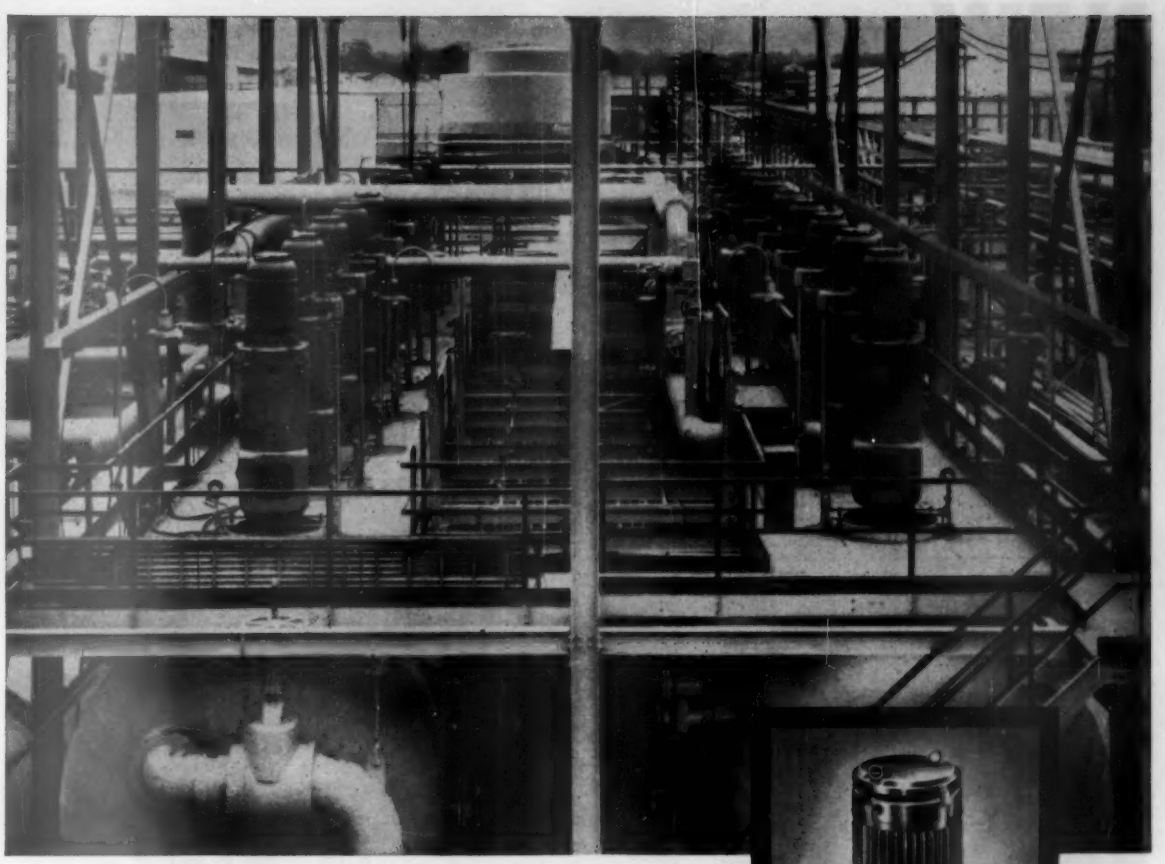
. . . enabling the user to adjust the speed to 60 double-strokes a minute when working grease of any consistency. The One-Fourth-Scale Model grease worker conforms in every detail to ASTM Specification D 1403-56-T, the maker says. It is powered by a gear-reduction motor. All working parts are made of stainless steel. A polished stainless-steel case mounted on a polished aluminum base houses the motor and drive mechanism. Delivery time is about 3 weeks and price is about $450. Source: **Forma Scientific, Inc., Box 543, Marietta, Ohio.**

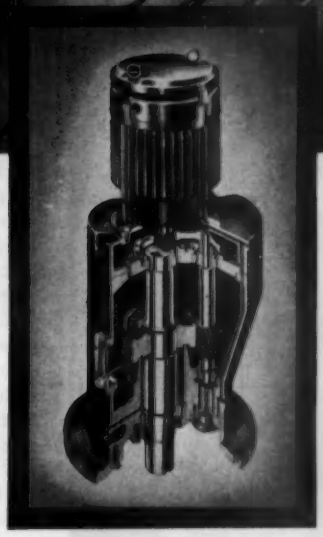
●

Portable screen encloses welding

. . . operations. The four-sided welding screen, called Four-some, is constructed of 1-in. tubular steel with a durable rustproof black oxide finish. Slip-joint construction makes it easy to assemble. Weighing only 85 lb., the 6-ft. screen folds for storage or removal to a new place.

The curtain comes in three materials





50 HP Philadelphia Mixers in continuous operation...

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Each of the forty-two Philadelphia Mixers in this pressure vessel mixing operation can produce 99,000 pound-inches of torque for continuous operation under difficult loading conditions . . . the kind of job where anything less than the best agitator shaft operation is an invitation to mechanical seal problems. *Significance:* Philadelphia Mixers have two important advantages over *all* other fluid mixers which assure best output shaft performance in difficult operations.

FIRST. In any comparative evaluation of mixers having equivalent torque capacity, a Philadelphia Mixer will *always* have the largest, heaviest duty, highest capacity bearings . . . and the drive with the best bearing support for shafting will have the truest running shaft.

SECOND. Because the bearings in Philadelphia Mixers are larger, the diameter of the output shaft is larger . . . and the design which has the largest diameter shaft will have least shaft deflection from hydraulic loads imposed on the mixing impeller during operation.

THESE ADVANTAGES come at no cost premium . . . you just get more mixer for your money. Six standard models, 1 to 200 HP. Special units to 500 HP. Horizontal or vertical motor drive. Mechanical seal or packed stuffing box. Paddle or turbine type impellers. Write for catalog A-19.

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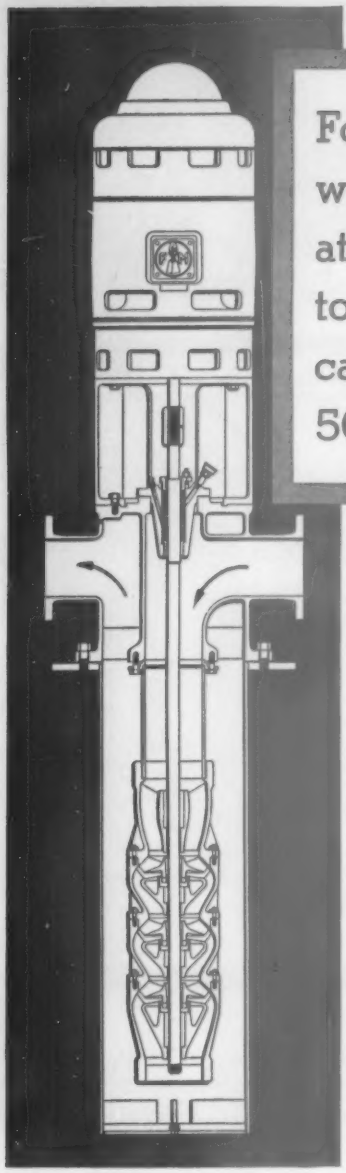
NEW Fairbanks-Morse Inverted Pot-Type Turbine Injection Pump



For lowest cost water flooding at pressures to 3000 psi., capacities to 50,000 bbl. per day

This advanced-design pump cuts initial and operating costs 4 ways: (1) Rugged, uncomplicated construction—only one moving part; no valves, no piston rods, no crankshaft to replace. (2) No high-pressure problems—the packing gland is in the suction line. (3) Permits increasing pressures without decreasing capacities. (4) Minimizes maintenance with recognized Fairbanks-Morse quality, including denser, tougher Pomoloy cast iron and lifetime Fairmortected surfaces.

Installations may be single or in series, depending on specific components selected for head capacity requirements. Power may be F-M direct electric drive, or right-angle drive with F-M motor or O-P diesel.

For complete information on the new Inverted Pot-Type Turbine Injection Pump, write Fairbanks, Morse & Co., Oilfield Division, 1713 N. Market St., Dallas 2, Texas.

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—12-oz. duck, neoprene-coated glass fiber, and aluminized asbestos. The screen can also be obtained with rubber wheel casters. Delivery time is 10 days. Price ranges from about $50 to $300. Source: **Singer Glove Mfg. Co., 860 West Weed Street, Chicago 22, Ill.**

•

Pavement insert aids leak survey

. . . for gas leakage. It is a permanent pavement insert made from high-density polyethylene. It is available in ¾ and 1¾-in. diameters by 6 in. long, which makes it long enough to go through most street slabs. The ¾-in. insert has a ⅛-in. pipe plug in the top and the 1¾-in. insert has a ½-in. socket-head cadmium-plated pipe plug.

Once the insert is set in the street, the pipe plug can be removed to accommodate a leak-detection probe for future surveys. Available from stock, the insert is colored bright orange to make it easy to locate. Prices range from $0.68 to $0.76. Source: **Central Plastics Distributing Co., Box 762, Shawnee, Okla.**

•

Flat-free nylon tire

. . . has been announced for use on lift trucks, front-end loaders, tractors, rotary cutters, cranes, and other industrial machinery requiring tires designed to eliminate down time.

The tires are vertically laminated

"No fundamental changes have occurred in the underlying forces which have made the oil industry a good bet for the long pull. Increased populations, increasing living standards, increased industrialization will make it necessary for the free world industry to provide in 1975 something in the order of 14,000,000 barrels a day more oil than were consumed in 1958. This means that by 1975 world oil demand will have increased by about thirteen times Saudi Arabia's current output." — M. J. Rathbone, President

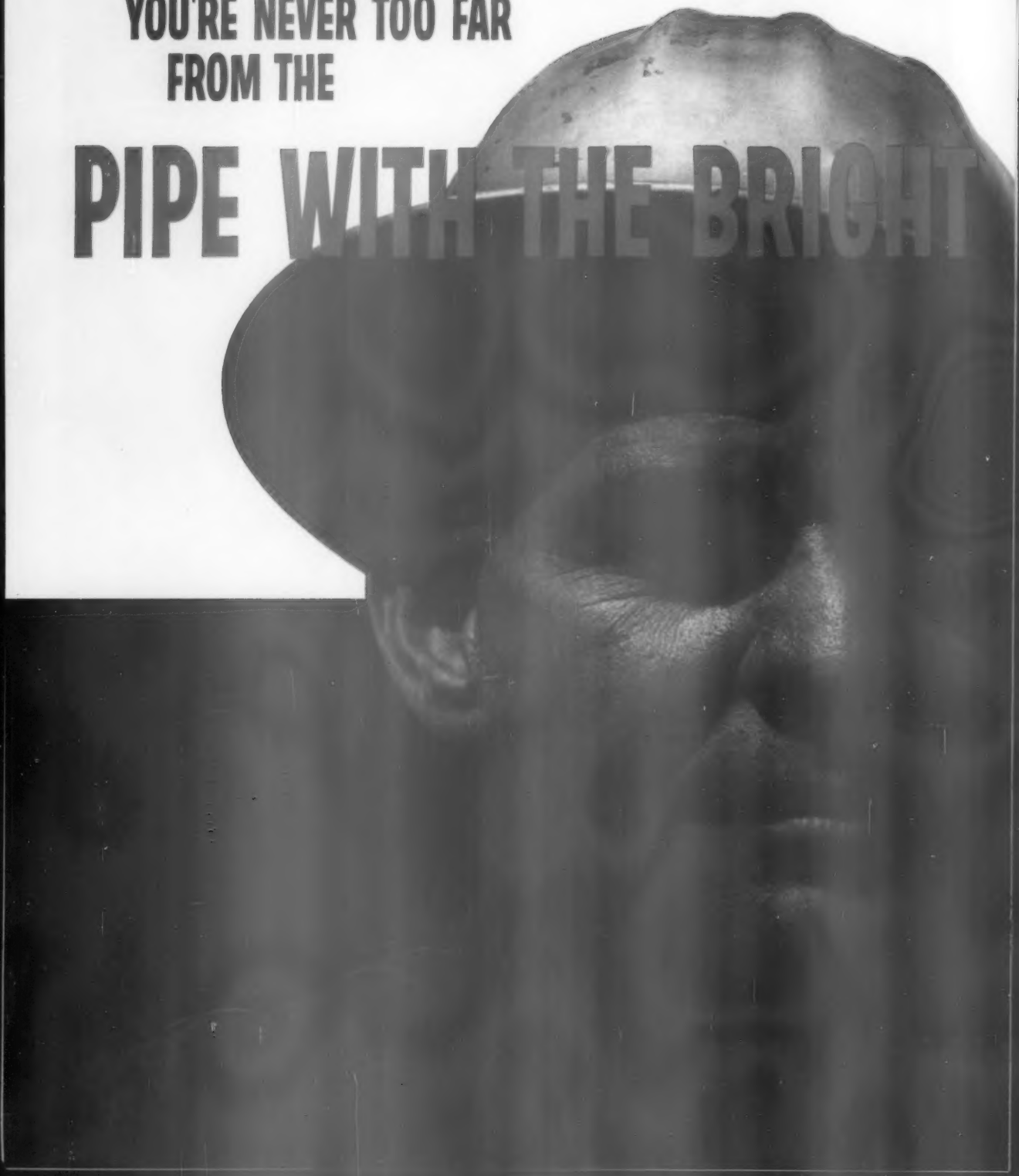
ESSO

Standard Oil Company (New Jersey)

and affiliated companies

WHEREVER
YOU ARE
YOU'RE NEVER TOO FAR
FROM THE

PIPE WITH THE BRIGHT



Throughout every active area in the oil patch, Orange Band Pipe Distributors have trained personnel and supply stores close to the point of use. It doesn't matter where you are — they will deliver the goods. The Youngstown Sheet and Tube Company, Youngstown 1, Ohio.

ORANGE BAND PIPE DISTRIBUTORS:

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FRANKLIN SUPPLY COMPANY
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LLOYD-SMITH COMPANY, INCORPORATED
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McJUNKIN CORPORATION
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MIDWAY SUPPLY COMPANY
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NORVELL-WILDER SUPPLY COMPANY
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WEAKS SUPPLY COMPANY, LIMITED
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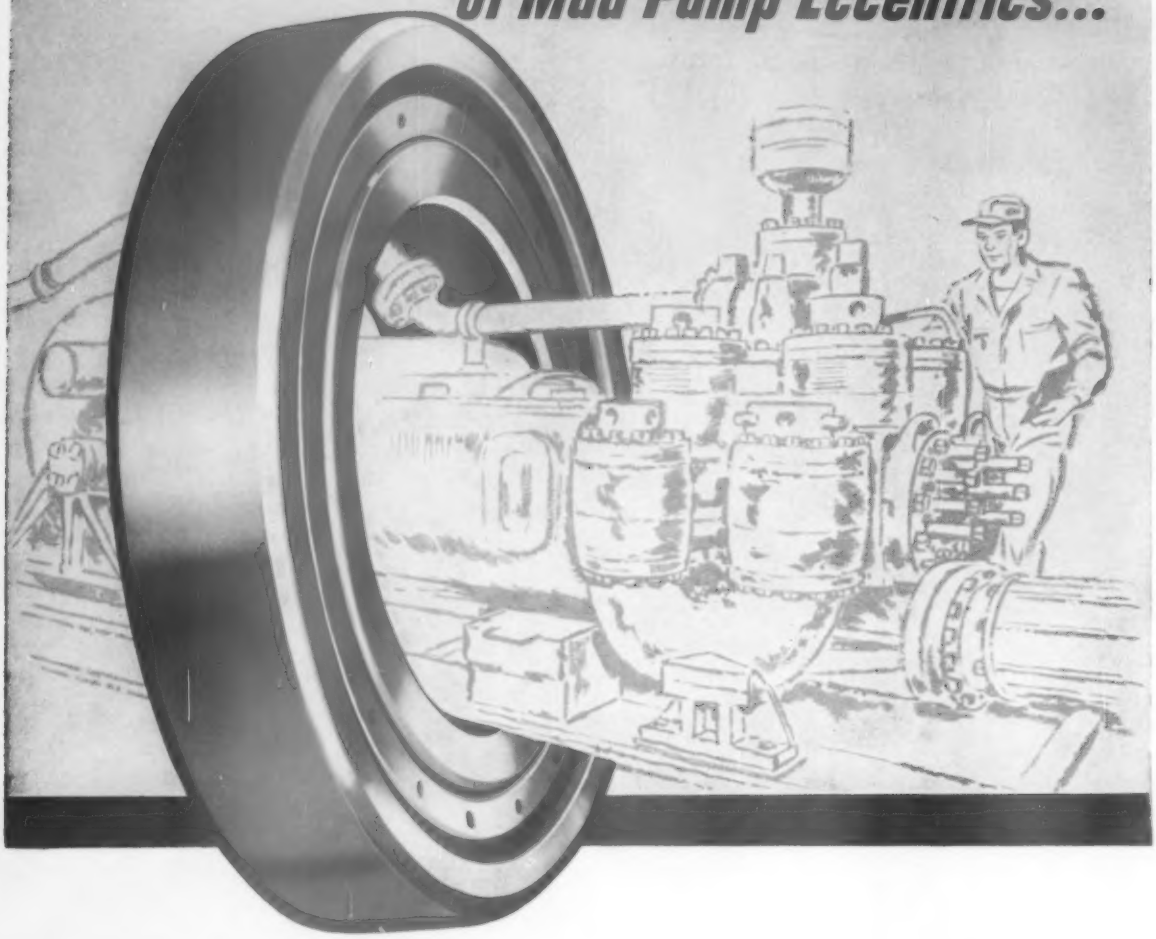
QUALITY YOUNGSTOWN SERVICE

Youngstown

SEAMLESS DRILL PIPE · CASING · TUBING

For the High-Impact Pounding of Mud Pump Eccentrics...



ROLLWAY MAXIMUM BEARINGS

Repeated high-impact loading puts mud pump eccentric bearings to a gruelling test. But Rollway Maximum Roller Bearings stand up. Their crowned solid cylindrical rollers distribute shock loads more evenly . . . increasing the life of rollers and races alike.

Rollube retainers—land-riding or roller-riding—offer better boundary lubrication to discourage skidding at low speeds. With twice the tensile strength and twice the permissible elongation of bronze retainers, closer tolerances between rollers and separators are possible, keeping misalignment and skew to a lower minimum.

In mud pumps . . . or *wherever* incessant pounding puts a premium on durability . . . specify Rollway Maximum Bearings . . . with Rollube® retainers.

Types for Every TOUGH SPOT

Transmissions • Blowout Preventers
Deep Well Pumps • Cat Heads
Speed Reducers • Traveling Blocks
Crown Blocks • Mud Pumps • Swivels
Walking Beams • Pitmans

ROLLWAY®
BEARINGS
COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Seattle • Houston • Philadelphia • LosAngeles • SanFrancisco

New Equipment

and have no air chamber, thus can ride in critical operating conditions over sharp, jagged stones, metal shavings, scrap metal, brick, and glass without damage.

The tires are made from parts composed from fabric and banded together with rubber and an internal steel band under high pressure. The maker claims that this method not only insures a tire life usually greater than the machine itself, but also a soft, bounce-free ride.

Sizes range from 4.00 by 4 to 12.00 by 24. Capacities are from 800 through 8,000 lb. Prices range from $13.65 through $500. Source: **Notat Tire Co., 1504 East Thirty-Fourth Street, Chattanooga, Tenn.**

●

Neoprene-base coating guards tanks

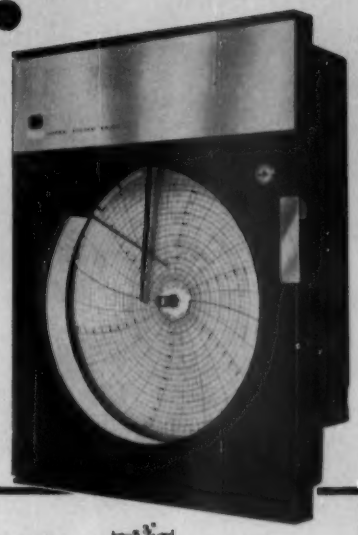
. . . and piping against chemicals and abrasion. Called Coro-Gard 1706, the coating is a one-part neoprene-rubber-based coating for protecting metal, wood, concrete, cloth, and some plastics against chemicals. Potential uses include protection of exterior pipes and tanks in refineries against alkaline spray and weathering, and protecting structural steel of offshore pumping stations against salt-water corrosion.

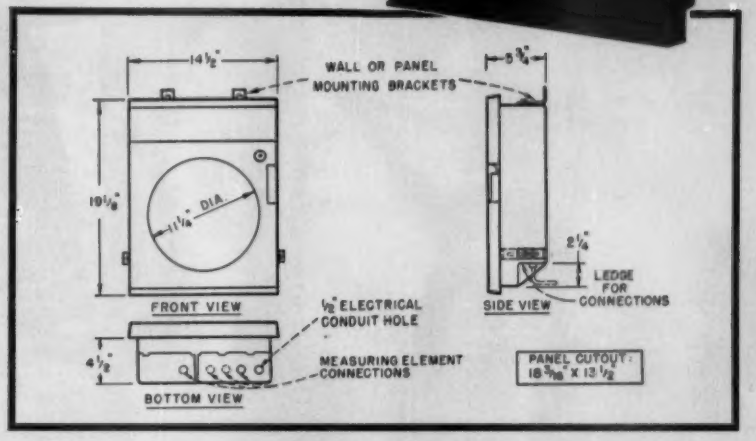
Because of a gell type of consistency, the coating can be applied by brush without the need of diluting or stirring it. Applied to vertical surfaces, it will not sag or flow, the maker says. Instead, it remains in position until it dries to a solid rubbery film. Only one or two coats are required on most applications to achieve proper thickness and to give the necessary protection. Source: **Minnesota Mining & Mfg. Co., 900 Bush Avenue, St. Paul 6.**

NEW!

MODERNIZED RECORDER HAS UNIVERSAL CASE for all mountings and connections

Also features largest chart opening in the industry





Now, the time-proved, field-proved United States Gauge 12-inch pressure and temperature recorder with completely new, trim, practical exterior design . . . including many important features found only on higher priced instruments. Now, outside and in . . . the USG Recorder offers still more quality, performance and advantages at a money-saving price.

Recessed back. Connections can enter case vertically or horizontally without special mounting.

Largest chart opening in the industry. 11¼-in. diameter for better visibility of chart. Shatterproof glass or blind door optional.

Removable door. New hinge pins permit easy removal of door for access to instrument.

Light weight. Cast aluminum case. Steel back plate provides rigid reference surface for components, prevents recording errors due to stress on case.

Modern design. Enhances modern equipment. Stainless steel escutcheon can be embossed with equipment manufacturer's name.

Fluorescent lighting optional. Ends overheating of case. Improved door skirt increases light on chart.

Dust ledge. Top and bottom. Protects door from dust, moisture.

Ball pivoted pen movements. Exclusive. For 1, 2, 3 or 4 pens.

Send for Bulletin 3025 today.

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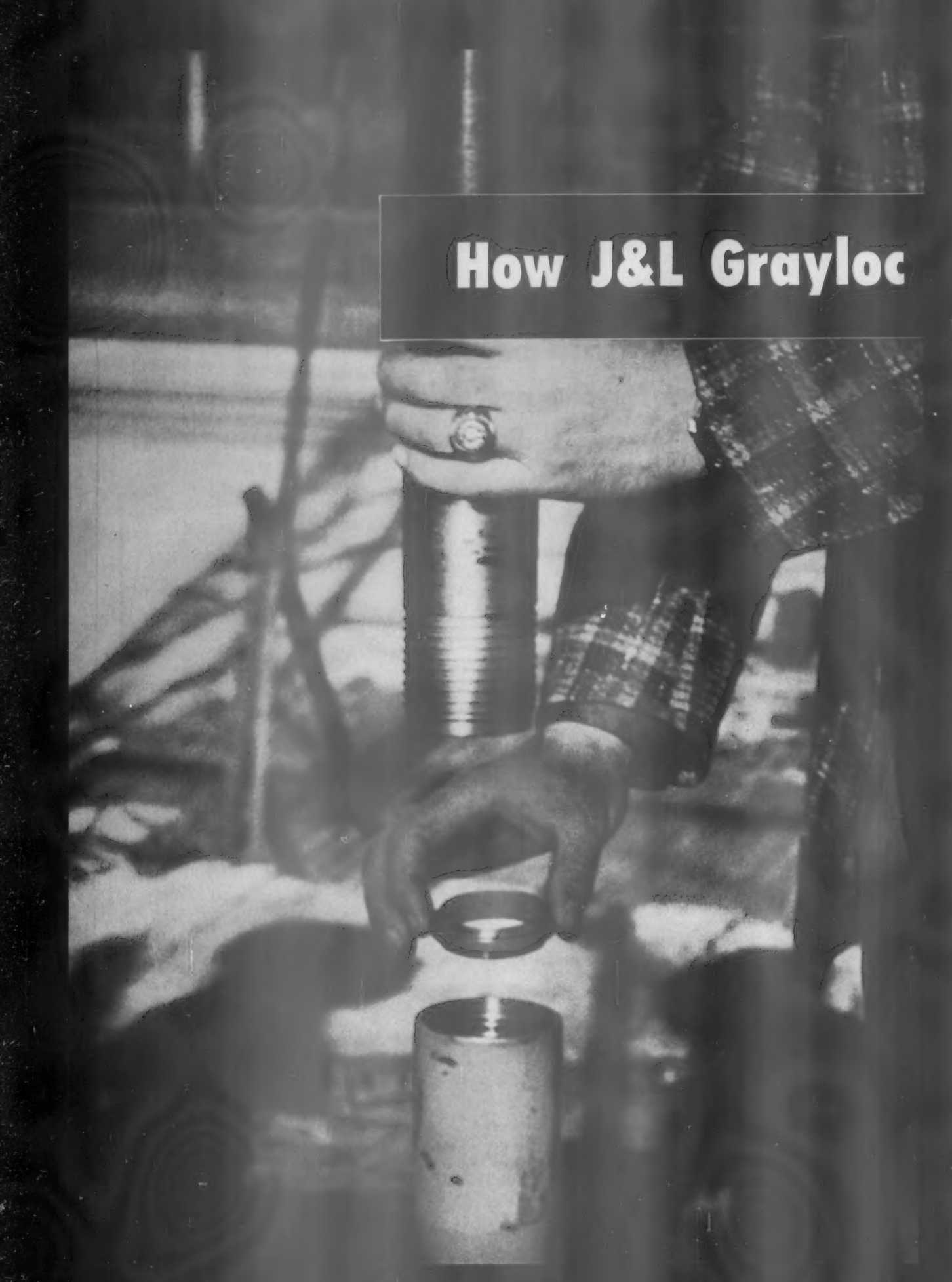

How J&L Grayloc

Ring-Seals Your Production

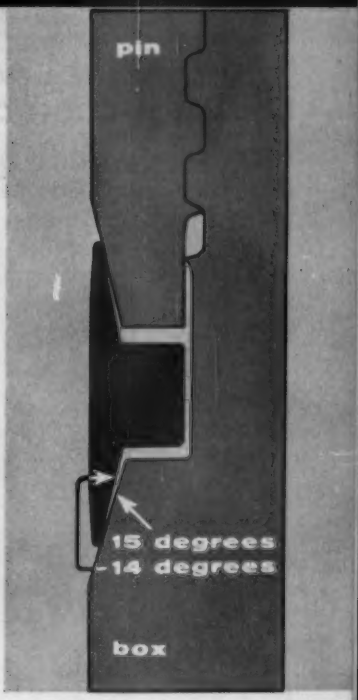
Jones & Laughlin Grayloc Tubing has a joint made leak-proof by a revolutionary seal ring. High internal pressures serve to make the seal more effective. See the drawing at right.

Note that sealing surfaces of the tubing are *inside* — not subject to damage. Modified Acme-type threads make stabbing easy, and give the connection greater strength than the body of the pipe.

The rigid segment of the steel ring transfers torque without damage, provides a positive stop in making up the joint and guards against distortion of the box.

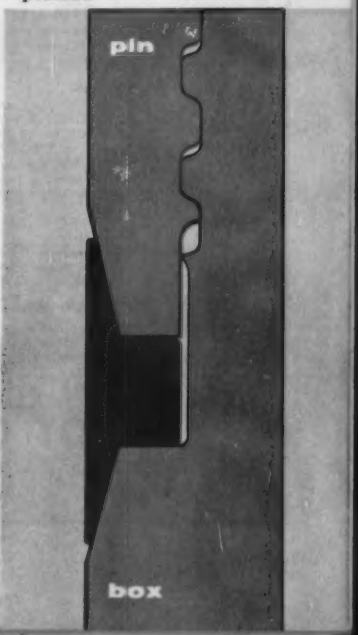
Reduced outside joint diameter makes *J&L Grayloc* ideal for dual completions.

Use *J&L Grayloc Tubing* to ring-seal your deep wells against high pressures! For immediate consideration, or for your files, call your J&L Supply man now for complete information.



Above: Line seal upon initial contact

Below: Surface seal at made-up position



Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....
It's the best available

83

DRILLING EQUIPMENT: JONES & LAUGHLIN DRILL PIPE, CASING AND WIRE ROPE, GARDNER-DENVER MUD PUMPS, IDECO DRILLING RIGS, REPUBLIC ROTARY HOSE. PRODUCTION EQUIPMENT: JONES & LAUGHLIN CASING, TUBING, LINE PIPE AND WIRE ROPE, AXELSON PUMPS AND SUCKER RODS, CABOT PUMPING UNITS, CENTURY MOTORS, FAIRBANKS-MORSE ENGINES, CONTINENTAL TANKS.

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FOR THE UTMOST RELIABILITY IN THE PROTECTION OF VALUABLE EQUIPMENT.

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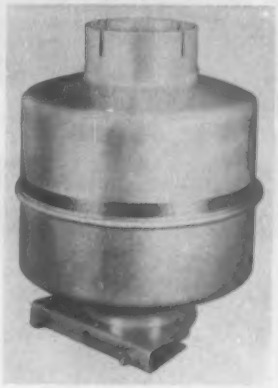
SHOWCASE . . .

New Equipment



Spark arrestor is made available

. . . for preventing exhaust-spark fires around drilling rigs, pumps, and other equipment used in the field. The Style 8CV40 spark arrester has been designed for gas or diesel engines using a 4-in. exhaust stack. Available from stock, the unit sells for about $48. Other sizes range in price from $9 to $120. The spark arrestor traps nearly all exhaust carbon from the engine at every throttle position, and provides for easy removal of the collected carbon. Source: **Erickson Products Co., 1960 Carroll Avenue, San Francisco 24.**

●

Trencher digs 5-ft.-deep ditch

. . . that is 12 in. wide. This Model-322 Ditch Witch is a new trencher scaled up from the maker's Model M-3 trencher to handle wider and deeper trenches and tougher digging conditions.

It promises to prove valuable for foundation footings, water lines to a 5 ft. cover, gas services and main extensions, underground cable installa-

This hypodermic could help cure your ailing gas conditioning system

This could be *your* sample ethanolamine solution that is being injected into a gas chromatograph for chemical analysis. This is just one of the many methods used by Jefferson's extensive research laboratories in Austin, Texas, to help you solve your gas processing problems. A wealth of technology and experience in such problems as high temperature corrosion, contamination, foaming characteristics, and excessive glycol losses is available expressly to serve your needs.

And whatever the findings, Jefferson has the *right* chemicals to meet your requirements in natural gas sweetening, refinery stream sweetening, sulfur recovery, carbon dioxide absorption, gas dehydration and hydrate prevention.

Monoethanolamine Diethanolamine
Ethylene Glycol Diethylene Glycol
Triethylene Glycol

HI-DRY® Liquid Desiccant

HI-DRY, Jefferson's special grade tetraethylene glycol, will give you the *extra* dew point depression so often needed in the dehydration of higher temperature gas streams.

You may have a knotty gas treating problem that's bothering you right now. Call the helpful Jefferson man . . . Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

Ethylene and Propylene Oxides, Glycols, Dichlorides, Carbonates • Ethanolamines
SURFONIC® Surface-Active Agents • Polyethylene and Polypropylene Glycols • Morpholine
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JEFFERSON CHEMICALS

ANOTHER IN A SERIES
OF MOTOR FACTS
FROM ALL INDUSTRIES

Sand... heavy rain... extreme heat...

Nothing stops These Westinghouse Life-Line A Motors

dependably driving oil well pumps in Odessa, Texas district of The Atlantic Refining Company, 24 hours per day, 7 days a week!

"Here's an application," says A. P. Johnston, production engineer at The Atlantic Refining Company, "where we must have continuous motor operation . . . sometimes for as long as 18 months . . . with virtually no maintenance or repair. Many of our pumping stations are remotely located, automatic and unmanned. Any stoppage or motor failure would result in the loss of several hundred barrels of oil. Motor repairs in the field are prohibitive in cost. We must have *complete* motor reliability and that's exactly what we get from our Westinghouse Life-Line® "A" motors."

How about you? Got a really tough motor application which you can't afford to pamper? Then ask your Westinghouse sales engineer to show you how the dependable Life-Line "A" pays for itself through reduced maintenance and repair. Or write to Westinghouse Electric Corp., P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J-22955-R

YOU CAN BE SURE...IF IT'S Westinghouse

On this pumping unit, the 15-hp Life-Line "A" motor operates in an atmosphere of damaging dust, sand and moisture. Despite continuous, heavy-duty service, motor has never suffered any overheating since first installed. Prelubricated bearings of the Life-Line "A" eliminate periodic greasing . . . keep lubricant in . . . dirt out.

RELIABLE BEARING LUBRICATION
of large vital, equipment is assured
with positive
VIKING
PUMPS

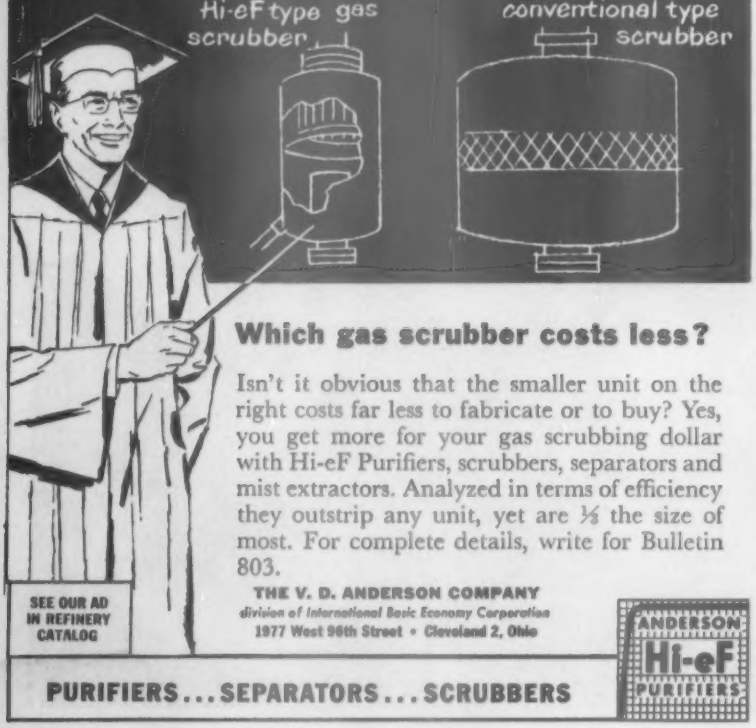
Non-failing operation is a "must" in applications like this gas booster station in service in west Texas. Use of Viking Pumps as original equipment for bearing lubrication service of three 2000 HP engines attests to their reliability, because complete success of pumps is of vital importance.

More and more equipment manufacturers recognize that highest quality in rotary pumps is assured with the original "gear-within-a-gear" Vikings. You, too, can depend upon Viking Pumps. Capacities available from ⅓ to 1050 gallons per minute.

Send today for folder 409 T.

VIKING PUMP CO.
Cedar Falls, Iowa, U.S.A.
In Canada, It's "ROTO-KING" Pumps
See Your Classified Telephone Directory
Offices and Distributors in Principal Cities

PURIFIER CHALK TALK #14



Which gas scrubber costs less?

Isn't it obvious that the smaller unit on the right costs far less to fabricate or to buy? Yes, you get more for your gas scrubbing dollar with Hi-eF Purifiers, scrubbers, separators and mist extractors. Analyzed in terms of efficiency they outstrip any unit, yet are ⅓ the size of most. For complete details, write for Bulletin 803.

SEE OUR AD IN REFINERY CATALOG

THE V. D. ANDERSON COMPANY
division of International Basic Economy Corporation
1977 West 96th Street • Cleveland 2, Ohio

ANDERSON Hi-eF PURIFIERS

PURIFIERS...SEPARATORS...SCRUBBERS

SHOWCASE . . .

New Equipment

tion, oil-field gathering lines, and salt-water lines. A 12-hp. air-cooled engine powers the trencher. Delivery time is about 10 days, and price ranges from about $1,200 to $1,500. Source: **Witch Marketing Co., 1959 West Fir Avenue, Perry, Okla.**

●

Kit ups fire-extinguisher ability

. . . of older portable carbon dioxide extinguishers now in use. The kit comprises a hose and discharge-horn assembly. It is designed for the maker's 10, 15, and 20 lb. carbon dioxide extinguishers now in the field. Replacement of older hose-horn assemblies with the new equipment requires no adapters or special equipment. Simply unscrew the old hose and screw in the new. A new horn-handle clip is included. Existing wall brackets can be reused after insertion of the new hose horn. The kits sell for about $9.60. Source: **Walter Kidde & Co., Inc., Belleville, N. J.**

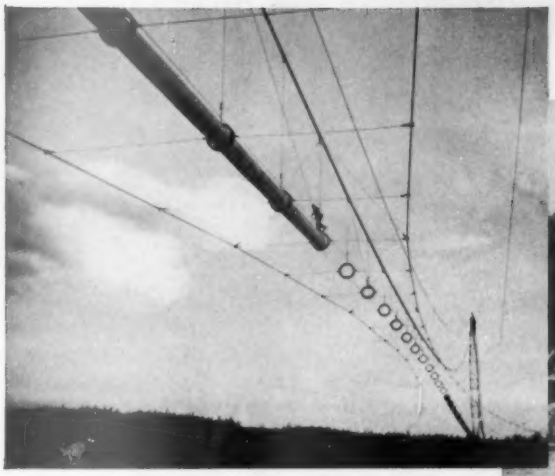
●

Compact V-belt drive available

. . . handles up to three times the horsepower of conventional V-belt drives occupying the same space. Too, the new Ultra-V drive weighs less and takes less space for a drive of a given horsepower as compared to conventional V-drives.

An advantage of the new drive is that the number of standard belt cross-sections is reduced from five to three to handle horsepower requirements from 1 to 1,500 hp. Cost is about 20% less than a standard V-belt drive of equivalent horsepower. Source: **T. B. Wood's Sons Co., Chambersburg, Pa.**

CLAYMONT
API large O.D. PIPE



. . . overhead

underwater. . .

. . . and for every standard or special use

- **Natural Gas or Crude Oil Transmission Lines (High Pressure)**
- **Low Pressure Gas Lines (within urban limits)**
- **Casing or Encasement Pipe for Highway and Railway Crossings**
- **Compressor Station Piping**
- **River Crossings (Heavy Type)**
- **Gas and Oil Storage Lines**

Widespread usage in these and a host of other applications clearly indicates customer confidence in Claymont's ability to produce top-quality welded steel pipe of all kinds to API and various other specifications.

Claymont, located on the Delaware River, with major dock facilities nearby, is ideally situated to ship by water to foreign and Gulf Coast producing centers. In addition, Claymont is also located on the main line of a major railroad.

Claymont produces its own steel, rolls its own plate, and has complete facilities for making large diameter API Pipe. Standard sizes from 22″ to 36″ O.D. and special sizes to customer specifications can be supplied. Claymont Pipe, regularly shipped in 40′ lengths, can also be supplied in 20′ or special lengths.

Realizing that economy is of paramount importance in pipelining, Claymont is now geared to produce pipe to API-5LX56 specification, thereby enabling you to reduce wall thickness and weight.

At the end of each rolling, we overrun adequate quantities of pipe to service our customer's quick-delivery requirements from stock. When you need large diameter pipe of any kind, for any use, check Claymont first.

OTHER CLAYMONT PRODUCTS: Carbon Steel Plates • Alloy Steel Plates • High Strength Low Alloy Steel Plates • CF&I Lectro-Clad Nickel Plated Steel Plates • Flanged and Dished Heads • Manhole Fittings and Covers • Fabricated Steel Plate Products

Claymont Steel Products

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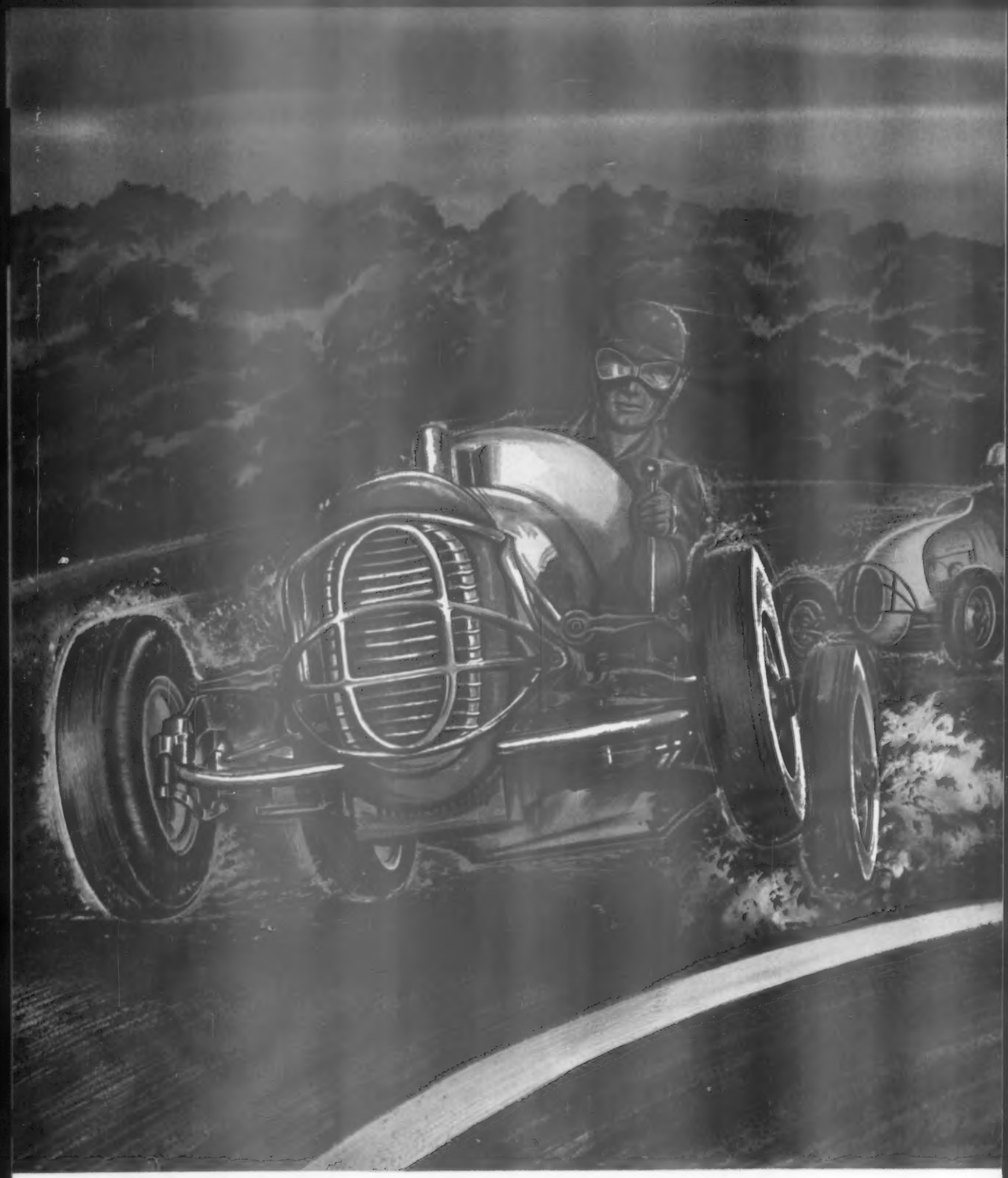


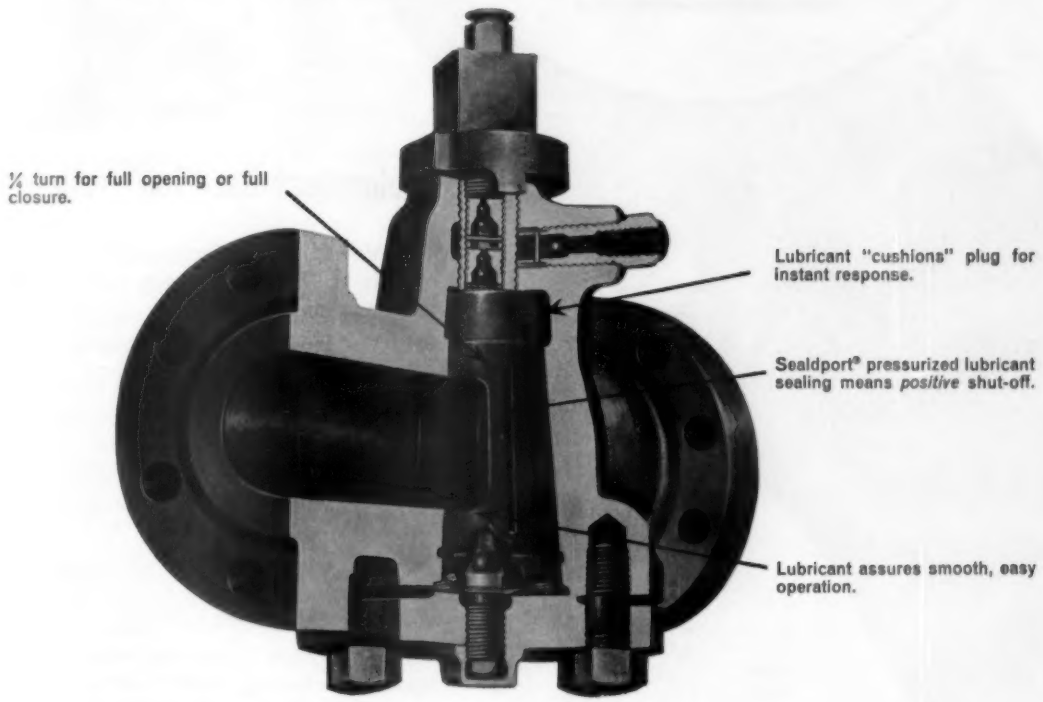
ROCKWELL- Nordstrom **VALVES**

Where control is vital

It isn't just speed and power that wins races . . . it's *control* that makes consistent winners.

It's the same with valves. Valves that are awkward or slow to operate may "lose the race" against impending disaster or costly flow control errors. That's why, wherever flow control must be instantly responsive, you'll see Rockwell-Nordstrom lubricated plug valves. Their *quarter-turn* lubricated closure means perfect control *every time.* The drawing below shows why these valves are so often demanded for the flow control jobs where errors can't be tolerated . . . and why they make flow control foolproof on every service.

PERFECT, FOOLPROOF VALVE OPERATION


¼ turn for full opening or full closure.
Lubricant "cushions" plug for instant response.
Sealdport® pressurized lubricant sealing means *positive* shut-off.
Lubricant assures smooth, easy operation.

Rockwell-Nordstrom is the original and world's most complete line of lubricated plug valves with sizes from ¾" to 36" and pressures to 15,000 lb. Available at leading oil field and industrial supply houses everywhere. For details, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. If you live outside the U. S. A., write: Rockwell International Division, Pittsburgh 8, Pa.

ROCKWELL-Nordstrom VALVES
another fine product by
ROCKWELL

®Reg. T.M. Rockwell Manufacturing Company

Proved by 9 years
continuous use in the field

MORSE "HY-VO"® CHAINS HELP MAKE HOLE FASTER

Toolpushers list "top" reasons why:

- "Hy-Vo" Chains and involute sprockets are built to take it. They run faster, cooler, quieter, cut vibration and live longer.
- "Hy-Vo" chain drives minimize downtime.
- "Hy-Vo" chains are fast and easy to assemble and disassemble in the field . . . no special tools needed.
- "Hy-Vo" chains operate more efficiently at high speeds . . . up to 8,250 f.p.m. and up to 5,000 h.p. loads.
- "Hy-Vo" chain drives permit compounding high speed, lighter weight engines for greater flexibility and equipment mobility.
- "Hy-Vo" chain drives are compact, eliminate space-consuming wide belt pulleys, costly extensive shafts and bearings.
- "Hy-Vo" chain drives cost less to operate.

When you order new rigs or new equipment be sure to specify Morse "Hy-Vo"* chain drives. Write Morse Chain Company, Dept. 22-129, Ithaca, N.Y. for full particulars today. Warehouses in Casper, Wyoming, Houston and Odessa, Tex., Farmington and Hobbs, N.M., Los Angeles, Calif. Export Sales: Borg-Warner International, Chicago 3, Ill., in Canada: Morse Chain of Canada, Ltd., Simcoe, Ont.

* "Hy-Vo", the coined name for this exclusive Morse design (from High Velocity and Involute, the sprocket tooth design) which differs widely from conventional silent chain design. U.S. Patent No. 2,725,755.

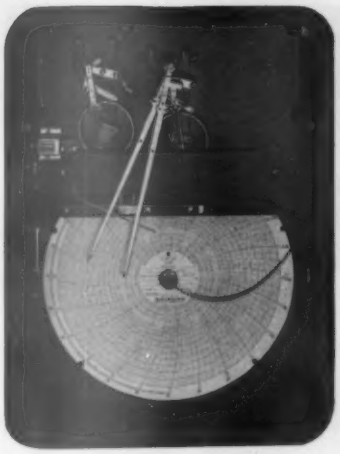
MORSE

MORSE BW BORG-WARNER

A BORG-WARNER INDUSTRY

*Trademark

ONLY MORSE OFFERS ALL FOUR: Chain and "Timing Belt"* Drives, Eberhardt-Denver Speed Reducers, Couplings, and Clutches.



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American Integrating Orifice Meters provide more accurate measurement by the continuous multiplication of the square root of the measured differential by the square root of the absolute line pressure.

Single, double and duplex-integrating models available in a wide range of manometer types and working pressures. Dust-proof, die-cast aluminum cases... Gasclok and electric instrument chart drives. Also supplied with American Telecounter for remote readings.

Ask for Bulletin 401 for complete details.

AMERICAN® METER COMPANY
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SHOWCASE . . .

New Literature

Pressure-reducing valves

. . . are featured in a new four-page bulletin, available gratis upon request. The single-seat, tight-closure, self-contained valves, which are spring-loaded, piston-operated, and actuated by internal pilots, can be used for steam, oil, air, gas, or water.

Maximum inlet pressures and temperatures range from 250 psi. at 450° F. in the cast-iron-body Type B valve to 900 psi. at 750° F. in five steel-body valves. The literature contains features, installation information, description of valve operation, as well as photos, valve drawings, dimensions, lists of materials, a capacity chart, and illustrations of typical installations.

The publication also includes a table containing maximum inlet pressures and temperatures and outlet spring pressure ranges of various valves. Source: **Atlas Valve Co., 280 South Street, Newark 5.**

New instrument-system bulletin

. . . discusses instruments for automatic operation and control of filter plants. Available for operation on 3 to 15 psi. output pressures, the instruments include integrated components for opening, closing, and modulating valves, regulating chemical-feed rates, and indicating and recording flow rates, levels, and pressures. Bulletin 1100B also describes instruments available for 0.25 to 3.25 psi. output pressures. Source: **Infilco, Inc., Tucson, Ariz.**

Industrial-tractor Bulletin CT-1959

. . . has just been published which features the Napco Crab four-wheel-drive, four-wheel-steer tractor. The four-page literature offers specifications along with such tractor features as: power-steering torque converter, hydraulic reversing clutch, planetary axles, and four-wheel hydraulic brakes.

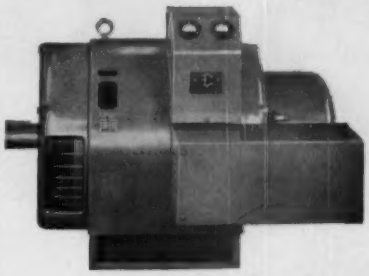
Featured are action photographs of the tractor with attachments which include dozer blade, backhoe, fork-lift, and street sweeper. Source: **Construction Equipment Div., Napco Industries, Inc., 834 North Seventh Street, Minneapolis 11.**

Relief valve prevents damage

. . . from overpressure in lines by opening immediately and automatically

If you hate maintenance, you'll like **E-M's** *new*

BRUSHLESS
"Packaged" Generator
BEMAC
(Brushless Excited Magnetic Amplifier Controlled)



BEMAC is available in ratings of 10 thru 150 kw, 3 phase; 10 thru 100 kw, 1 phase; 1200 and 1800 rpm; 0.8 PF; 60 cycles; broad-range voltages of: 120/208-139/240 and 240/416-277/480 volts, 3 phase; 120/240 volts, 1 phase.

NO COMMUTATOR!
NO SLIP RINGS!
NO BRUSHES!

Here is a generator that is *practically maintenance-free.* It requires no servicing other than an occasional bearing check. Efficient, reliable, ageless silicon diodes rectify the exciter a.c. to d.c., eliminating the need for commutators, brushes, and slip rings. There are many advantages:

Better suited to dusty, corrosive atmospheres. No electrical parts subject to wear and damage from dust and dirt.

Safer in hazardous atmospheres. No moving electrical contacts. Sparking is eliminated.

Easier to operate. No complicated adjustments—anyone can operate BEMAC.

Magnetic amplifier regulated. Voltage regulation is automatic. A unique static voltage sensing circuit gives ±2% regulation.

"Rock-Steady" voltage makes your motors, lights, and electronic equipment work better.

Starts big motors. Built-in voltage boost transformer makes big motor starting easier.

Simple to install. BEMAC is self-contained, completely factory assembled.

● *Publication 255 tells how BEMAC Generators work. Write for a free copy and call your E-M Field Engineer.*

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota
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The Originators of "Packaged" Generators

Lower Maintenance,

The Finest Products
Made with Aluminum
are made with
REYNOLDS ALUMINUM

Reynolds Colorweld Aluminum jacketing adds color and protection on vessels and piping at Superior Oil's Lowry gas processing plant. Colorweld's tough enamel finish eliminates site painting, outlasts two or three ordinary paint jobs.

Lasting Protection

...and COLOR WITHOUT PAINTING!

Superior Oil Company Lowers Costs, Beautifies Plant With Pre-enameled Jacketing of Reynolds Colorweld Aluminum

TRADE-MARK

Superior Oil has installed jacketing made of Reynolds Aluminum on the process vessels and pipe lines at its new Lowry gas processing plant near Lake Arthur, La. But this is aluminum jacketing with the big *plus*. It's made with Reynolds Colorweld—*pre-painted* aluminum for added beauty and lower maintenance.

With Colorweld, Superior gets the durability, low-maintenance and corrosion-resistant protection of aluminum jacketing, with all its excellent heat-reflecting and insulating properties. *And* it gets the added beauty and protection of a permanent baked enamel finish, *without* the expense of site painting.

Hudson Engineering Corporation, Houston, designed and built the plant. Fuller-Austin Insulation Company, Houston, installed the Colorweld jacketing.

Colorweld jacketing adds eye-appeal to a processing plant, but it does even more: It will stay new-looking and clean with little or no attention. Its tough, baked enamel finish can be expected to outlast two or three ordinary paintings. Colorweld finishes won't fade or weather, and will resist scratching, peeling and chipping even throughout forming and fabrication.

The Lowry plant jacketing is .020″, .024″ and .025″ sheet, but Reynolds Colorweld Aluminum coils are available from .016″ to .051″, in widths from ½″ to 60″. It is offered in a wide range of colors, tempers and alloys.

For the durability and low-maintenance protection of aluminum, plus the bonus of a tough, colorful enamel finish, investigate Reynolds Aluminum Colorweld coil, for jacketing and other applications. Contact your local Reynolds office, or write *Reynolds Metals Company, P.O. Box 2346-CR, Richmond 18, Va.*

REYNOLDS ALUMINUM

Watch Reynolds TV shows—"ALL STAR GOLF" and "ADVENTURES IN PARADISE"—ABC-TV

SINCLAIR GARY and a sister ship are the only tankers in Greater Chicago area specially designed for offshore fueling service.

Only Sinclair Could Quench This Navy Thirst

This year, for the first time, deep-water ships of the U. S. Navy sailed the Great Lakes. A task force of 22 vessels visited important ports on a special training mission. And, having traveled light to pass through the new Seaway, 22 ships were thirsty for fuel by the time they dropped anchor at Chicago, far from home base.

To quench this thirst *the Navy called on Sinclair Refining Company*, the only supplier equipped to make volume deliveries offshore. In a round-the-clock operation, 2,500,000 gallons of heavy oil were pumped into ships' bunkers. The task force sailed on schedule.

The ability of its marketing subsidiary to deliver quality products with the most modern equipment is one reason why Sinclair Oil Corporation, measured by total assets, is the *nation's sixteenth largest industrial company.*

Sinclair

A Great Name in Oil

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IT WILL PAY YOU TO

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FASTEST GROWING

OIL & GAS FIELD

PROCESSING EQUIPMENT COMPANY IN THE U. S.!

Now — MC is the third largest company of its kind in America! All your tank and production unit needs can be met by our growing organization.

We have recently acquired the

UNION TANK CO.

Combined engineering facilities, more complete products and lines for the industry, DOUBLED sales and service personnel. The best features and patents of both companies! For **better** products, **better** service, **better** see . . .

The NEW Expanded

MALONEY-CRAWFORD TANK AND MANUFACTURING CO.

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MC 1909

OIL WELL ENGINEERED

Canadian Distributor: Maloney-Crawford Tank and Service Co. Edmonton, Alberta, Canada

SALES OFFICES: Houston • Dallas • Ft. Worth • Midland • Denver

BRANCH STOCKING POINTS: New Orleans, Lafayette, Houston, Corpus Christi, Sterling, Great Bend, Liberal, Plainview, Farmington, Odessa, Hobbs, Oklahoma City, Nocona

whenever line pressure exceeds a predetermined setting. When pressure returns to normal, the valve is slowly "cushioned" to a tightly closed position.

New Bulletin SEW shows how the valve gives full pipe flow with little interference. It points out that there are no small parts to clog and only one moving part—a large rubber-faced disk—to contact the flow. Source: **Golden-Anderson Valve Specialty Co., 1281 Ridge Avenue, Pittsburgh 33.**

Eight-page corporate brochure

. . . introduces you to the personnel, projects, and services of Litwin Engineering Co., Wichita, Kans. The publication outlines backgrounds of company executives; lists projects undertaken; and shows both ordinary and specialized services with which the company deals. Photos of different projects are given along with construction and engineering illustrations. Source: **Litwin Engineering Co., 204 North Waco, Wichita, Kans.**

Motorized wheel for off-highway

. . . excavation vehicles is discussed in new Bulletin GEA-6931 now available. The eight-page, four-color publication offers information on performance, economy, application, operation, and benefits of the electric wheels which eliminate the need for axles, transmission, differentials, and drive shafts.

Drawings indicate types of vehicles which can use this type of drive, and graphs provide statistics on speed, efficiency, and tractive effort when either two or four motorized wheels are used. Source: **General Electric Co., Schenectady 5, N. Y.**

Specialty-steel buyers guide

. . . contains detailed information on tool and die steels; stainless steels; high-temperature alloys; electronic, magnetic, and electrical alloys; special-purpose alloy steels; tubing and pipe; and fine-wire specialties.

Included in the 40-page booklet is a tool-steel selector chart which provides a system of matching tool steels. Numerous tables show the properties and workability of stainless-steel types and high-temperature alloys.

A section on electronic alloys contains graphs which compare expansion characteristics, electrical resistance, permeability, and magnetic flux density of various metals for electrical, magnetic, and electronic applications.

Twenty-six types of stainless and

SPECIFY 500 TON for LONGER THREAD LIFE!

Protects more tool joint threads than any other compound!

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KRAFTBILT is the line of filing equipment and supplies specially designed for the oil industry.

For CATALOG 59-A, write: Dept. J-669

ROSS-MARTIN COMPANY
P.O. BOX 800, TULSA 1, OKLAHOMA

supercorrosion-resistant tubing and pipe are described, including sizes available and recommended uses. Source: **Carpenter Steel Co., 3030 West Bern Street, Reading, Pa.**

Ductile-iron regulators

. . . and control valves are discussed in new, four-page Bulletin J-DI. It describes the composition, properties, specifications, comparison tables on steel, case iron, and red brass, and the results of a severe quench test on ductile-iron valves. The bulletin explains how ductile iron is able to replace steel in many applications at a lower cost. Also illustrated are gate seats which are available in the regulators. Source: **OPW-Jordan, 6013 Wiehe Road, Cincinnati 13.**

Welding-wires pocket guide

. . . has just been published which contains information on gas-shielded metal arc-welding wires, including data on A675 steel wire, A666 steel, and A556 aluminum. The 84-page guide provides answers to questions on steel, aluminum, copper and copper base, stainless steel, and titanium.

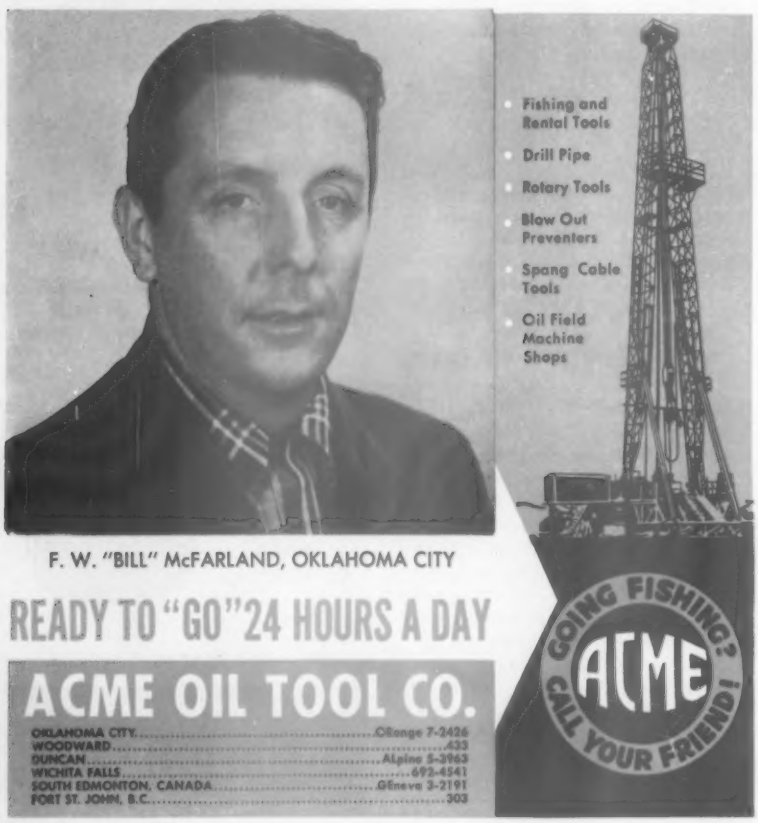
Booklet ADC 873A contains technical information such as chemical composition, mechanical properties, and operating procedures, as well as wire diameters and packaging data. Conformances and approvals are also shown for each wire where applicable. Source: **Air Reduction Sales Co., 150 East Forty-Second Street, New York 17.**

Pipelayer booklet reviews features

. . . of Turbochargers, track rollers and idlers, dry-type air cleaners, and other machine highlights. Form D926 illustrates applications of equipment on pipeline jobs, including crawler tractors for backfilling, ripping, and clearing; and Traxcavators for piling brush and trees for burning. Twin-Arc welders are also discussed. Source: **Caterpillar Tractor Co., Peoria, Ill.**

Branch-connection fitting

. . . called the W-S Fishmouth is illustrated in a new 16-page booklet, free for the asking. The literature describes applications and benefits of the fitting, and covers cost comparisons, engineering-design data, points of practical use, and benefits. According to the publication, the new fitting is inexpensive, accurate in shape, and reduces job time. Source: **Forge & Fittings Div., H. K. Porter Co., Roselle, N. J.**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FORT ST. JOHN, B.C. 303
GOING FISHING? ACME CALL YOUR FRIEND!

Gas-fired storage water heater

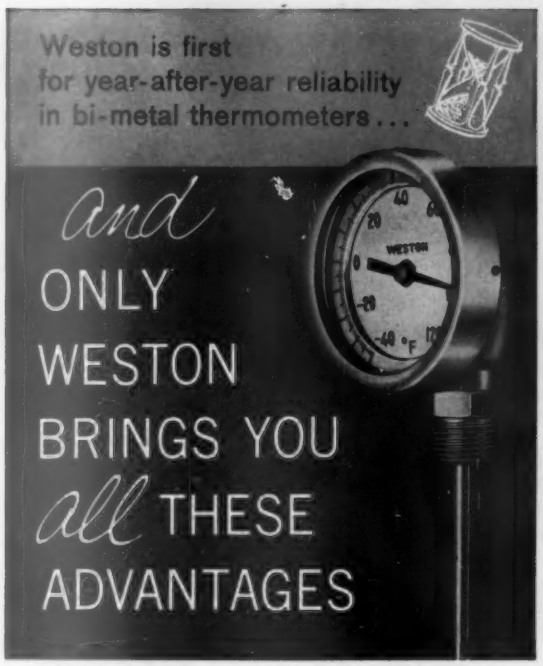
. . . trade-named Scalefree is detailed in new 20-page Bulletin 4. Available upon request, the bulletin describes design, operation, construction features, and installation specifications of the completely packaged unit.

Diagrams and schematic drawings are used to define three basic systems —the gas-burning unit, forced-circulation transfer-fluid system, and the service-water system.

Included are design specifications, standard weights, dimensions, capacities, and construction materials. Source: **Patterson-Kelley Co., Inc., East Stroudsburg, Pa.**

160-page fleet catalog

. . . contains specifications on commercial and industrial applications of numerous products. Divided into five sections for quick and easy reference, the catalog covers spark plug, oil filter, fuel pump, air cleaner, and gasoline strainer applications. It also contains service-tool information and complete replacement-part conversion listings and interchangeability information from factory parts numbers. Source: **AC Spark Plug Div., General Motors Corp., Flint 2, Mich.**



Breadth of line . . . number of desired features . . . quality of craftsmanship . . . ruggedness and stability – from any point of view, Weston thermometers are unsurpassed. Yes, the company that introduced the bi-metal to industry continues its leadership. That's why your smartest move is to entrust your process to no thermometer but a Weston.

FOR EXAMPLE, LOOK AT ALL THE ADVANTAGES YOU GET WITH THE NEW WESTON '4000' SERIES:

- ALL STAINLESS STEEL CONSTRUCTION, INCLUDING WELDS, AND IN-LINE SCALES AND POINTERS TO ELIMINATE MIS-READING DUE TO PARALLAX
- EXTERNAL ADJUSTMENT FEATURE PROVIDED AS STANDARD EQUIPMENT
- REMOVABLE BEZELS FOR EASY WINDOW REPLACEMENT IN THE FIELD
- ADVANCED GASKET MATERIAL TO PROTECT AGAINST "BREATHING" AND LEAKAGE EVEN UNDER EXTREME OUTDOOR ENVIRONMENTAL CONDITIONS AND LOW TEMPERATURE MEASUREMENT SERVICE WITHOUT FOGGING OR FREEZE-UP
- GUARANTEED ACCURACIES WITHIN 1% OF RANGE OVER ENTIRE SCALE
- FULL LINE OF SIZES, STEM LENGTHS AND RANGES IN BACK AND BOTTOM-CONNECTED MODELS

For full information and name of local distributor, contact your local Weston representative . . . or write to Daystrom-Weston Sales Division, Newark 12, N. J. *In Canada: Daystrom Ltd., 840 Caledonia Rd., Toronto 19, Ont. Export: Daystrom Int'l., 100 Empire St., Newark 12, N. J.*

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Bi-metal Thermometers

WORLD LEADER IN MEASUREMENT AND CONTROL

RIDGID Thread Cutting Oils are available in convenient (4 ounce Nu-Clear only), 1 quart, 1 gallon, (2 gallon Nu-Clear only), 5 gallon, 30 gallon and 55 gallon containers.

Tests prove RIDGID® Thread Cutting Oil gives you better threads faster...lengthens die life, too!

Recently a distributor in Atlanta, Georgia investigated a complaint of "bad pipe". Test threads were made in all sizes. Torn threads resulted. Then RIDGID Nu-Clear Thread Cutting Oil was substituted for the oil being used. Perfect threads were obtained every time.

Here, then, is dramatic proof that you need a special purpose thread cutting oil . . . an oil that *cools, speeds metal removal, produces a smooth finish,* and *prevents chips from welding to your dies.*

No oil—in its pure state—will perform all these functions. That's why RIDGID Thread Cutting Oils are an exclusive, exactly formulated combination of oils, blended for easier, faster threading . . . longer die life. What's more, these special-purpose RIDGID oils are completely anti-septic . . . no danger of irritation or infection.

Make sure of good threads every time. Order RIDGID Thread Cutting Oil from your Supply House today. Tops for *all* metal cutting . . . you'll want an extra supply for your lathe, drill press and other metal cutting equipment.

RIDGID

The Ridge Tool Company • Elyria, Ohio, U.S.A.

▶ ▶ ▶ Equipment Men Notes

Name change is announced

Clare G. Miller

Crose-Perrault Equipment Corp. will soon become the new corporate name when the merger of two Tulsa manufacturers — M. J. Crose Mfg. Co., Inc. and Perrault Equipment Co.—is completed within a short time, Clare G. Miller, Crose president, announces.

"Since the products and services of both companies are well known and highly respected by pipeliners around the world, it is fitting that the names of both companies be included in the new organization," Miller stated.

All key personnel of Perrault have been retained along with Crose's men,

J. W. Brand

John Behrenfeld

to make up the organization of the newly merged companies, Miller said. The merged firm will continue to stock and deliver pipe-wrapping materials at both Tulsa and Houston for immediate delivery. At the same time Crose also announced the promotion of several of its key men.

Ben Montgomery

W. H. Royal

John W. Brand, recently moved to Tulsa to become a vice president of the parent Crose company, has now been named vice president and general manager. Brand will retain active management of the Tulsa manufacturer's Canadian subsidiary, Crose-Curran, Ltd., in addition to his new duties in Tulsa.

John Behrenfeld, a vice president, has been transferred to New York City, where he will head up Crose's export department. He will spend a good portion of his time traveling in foreign countries throughout the world. In January he is scheduled for a 2-month trip to Europe and The Middle East, and in June plans to go to Central and South America.

Ben Montgomery is a newly elected vice president. In addition to these duties, Montgomery will remain in Houston, in charge of the company's division there.

W. H. (Buck) Royal has been appointed sales manager, the post formerly held by Behrenfeld, and has been moved to Tulsa from Denver, where he was manager of the western division of Crose.

BAROID DIVISION IS HOST to 100 West Texas-New Mexico drilling-industry representatives at the company's recent second Symposium on Drilling Mechanics. Shown at the Midland, Tex. meeting are, from left: W. E. Schultz, Shell Oil Co.; P. L. Pope, Phillips Petroleum Co.; and three Gulf Oil Co. representatives—C. C. Von Elm, B. J. Collings, and Riley Griffin.

Parkersburg Rig & Reel opens

. . . a district sales office in Pampa, Tex., staffed by District Salesman Don L. Henry. Henry has been with Parkersburg since 1953. The company is a division of Parkersburg-Aetna Corp.

Ewart is advertising manager

R. R. Ewart

. . . of Avondale Marine Ways, Inc. He will work direct with the Avondale sales department, headed by R. Lamar Woodfin, general sales manager, with offices at the company's Avondale, La. main plant. Prior to joining Avondale, R. Raymond Ewart was marine diesel specialist for Fairbanks, Morse & Co.; marine engineer for Union Sulphur Co.; technical writer and supervisor for Dravo Corp.; marine engineer for the U. S. Maritime Administration; and technical editor of Oil Magazine.

Ideco, Inc. ships four rigs

. . . for Southeastern Drilling Co. in Argentina from Beaumont, bound for Puerto Deseado, Argentina. Southeastern Drilling was recently awarded a contract to drill 1,000 wells in Argentina for Y.P.F., the Argentine government oil company.

The shipment also includes camp equipment, bits, warehouse stocks, drilling muds, cement, and heavy transportation equipment.

Shown in front of the Mud-Master 600 mud pumps being sent in the first shipment are, from left, front row: Gordon G. Wilbur, Ideco vice president; Paul A. Turnbull, Turnbull & Zoch Drilling Co.; J. W. Rhea, Southeastern executive vice president; Jack Hilder, Ideco domestic sales manager; and E. F. (Gene) Shiels, Ideco's vice president in charge of marketing.

In the back row are George W. Walton, Ideco president; W. P. Clements, Jr., Southeastern president; W. O. (Bill) Cook, Ideco senior vice president; and R. A. LeFleur, assistant general manager of Ideco's Beaumont plant.

Six vice presidents are named

. . . by Cameron Iron Works, Inc. They are: A. D. Blackledge, vice president and assistant manager; W. R. Davis, vice president and manager of the Pressure Control Equipment Division; J. H. Grubb, vice president and International Division manager; J. W. Brougher, vice president and Special Products Division manager; C. G. Hayward, vice president and controller; and J. B. Ogden, vice president and industrial-relations manager.

A. D. Blackledge

W. R. Davis

J. H. Grubb

Meanwhile, Cameron directors reelected the following officers: J. S. Abercrombie, president and chairman; R. H. McCullough, secretary and treasurer; Herbert Allen, vice president and general manager.

Ben Anderson appointed manager

. . . of Milwhite Mud Sales Co.'s West Texas division with headquarters at Midland, Tex. A company employe since 1956, he has 24-years experience in drilling and production. Other Milwhite appointments involve George W. (Bill) Bowman, Jack Nini, and James N. Statton. Bowman will work out of Fort Worth as a sales representative. He owned his own company as a distributor of drilling muds after working for Reed Roller Bit Co.

Ben Anderson

Nini, a new addition to Milwhite's sales staff, will locate in Midland. Statton, company salesman in New Orleans, has been transferred to Midland, where he will continue in sales work. He has been with the company since 1952.

J. A. MacIntire, Jr. promoted

. . . to general sales manager of Republic Rubber Division, Lee Rubber & Tire Corp., reports E. M. Ikirt, Republic's general manager. MacIntire will fill the office made vacant by the recent death of C. R. Conklin. MacIntire joined Republic in 1953 as assistant manager of wire-braid-hose sales. The following year he was appointed Chicago district manager and in 1955 returned to Youngstown as manager of wire-braid-hose sales, which position he has held ever since.

J. A. MacIntire, Jr.

Brill Equipment Co. moves

. . . its New York offices and warehouses to the company's own building in Newark. No change was announced in the location of Brill's Houston office.

Parker Seal adds R. C. Rickey

. . . to its staff where he will be responsible for the territory and accounts encompassed in an area which covers Arkansas, Texas, Mississippi,

The noted series from the Oil and Gas Journal now available in one volume

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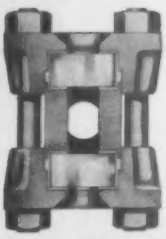
USED IN REFINERIES AND CHEMICAL PLANTS THROUGHOUT THE WORLD



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Single or Multiple Sections

TUBULAR

Gauge Cocks

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Large Chamber Reflex Gauges

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Heated or Cooled Gauges

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NICOLET AVE., FLORHAM PARK, N. J.

Louisiana, and Tennessee. Rickey was formerly with Precision Rubber Co. as laboratory manager and as Lebanon plant manager.

James B. Lonergan is appointed

. . . advertising manager of Ethyl Corp., announces Malcolm P. Murdock, vice president in charge of sales. Lonergan will serve on the staff of Russell B. Weston, director of advertising, sales promotion, and merchandise management. The new advertising manager has been with Ethyl the past 16 years and has been a member of the advertising staff since 1951.

Petreco Division is responsible

. . . for all equipment sales and process engineering for Petrolite Corp.'s domestic and Canadian divisions. The report comes from Gordon S. Nees, vice president of Petrolite Corp. and general manager of Petreco Division, Houston.

As part of this move, the Tretolite chemical-desalting-process equipment

C. P. Siess J. R. Moechel

now will be marketed by the Petreco organization. Tret-O-Lite desalting chemicals will continue to be distributed and serviced by Tretolite Division refinery service staff.

Equipment and processing sales will be managed by Charles P. Siess, Jr., recently transferred to the Houston headquarters of Petreco Division from Tretolite Division at St. Louis. Also transferred to Houston was J. R. (Bob) Moechel, who will be in charge of sales of chemical-desalting-process equipment. Moechel was in charge of refinery sales and service for Tretolite.

Sales of electric processing equipment will be under the direction of H. R. (Reg) Jarvis, who has been in

H. R. Jarvis L. C. Waterman

charge of the Fort Worth regional office for Petreco. Jarvis will move to Houston.

Logan C. Waterman, former sales manager for Petreco processing equipment, has been promoted to director of a new development department for which extensive laboratory and office facilities will be built in Houston.

J&L transfers G. R. Cain

. . . to Borger, Tex. as a salesman, according to W. L. Wolfe, vice president, sales, of Jones & Laughlin Supply Division. Cain first became associated with the division as a storeman at the Newcastle, Wyo. store in 1954.

He later served in similar capacities at Casper, Wyo. and Hobbs, N. M. Cain was promoted to salesman and assigned to Kermit, Tex. last year.

OFFICERS PRESENT AT SIGNING of Granberg Corp. as a subsidiary of American Meter Co., Inc. include, from left: R. C. Anderson, vice president in charge of operations; R. J. Wetjen, vice president and general manager; A. J. Granberg, founder and special consultant; W. G. Hamilton, Jr., president of American Meter; and A. McBeath, American Meter comptroller. Manufacturing and sales operations of the Oakland, Calif. firm will be continued under the new management in a 30,000 sq. ft. two-building plant.

Cooper

DOUBLES RIGS HAVE ARRIVED

In only a few months Cooper Skytop Rigs have gone to work in Louisiana, East Texas, West Texas, Gulf Coast, Texas Panhandle, Mississippi, Montana, North Dakota, Wyoming, Oklahoma, Canada, and Mexico. But that's not all, many more are on the way because Cooper Skytops are setting new standards for oil well servicing. If they are not now working near you they will be soon.

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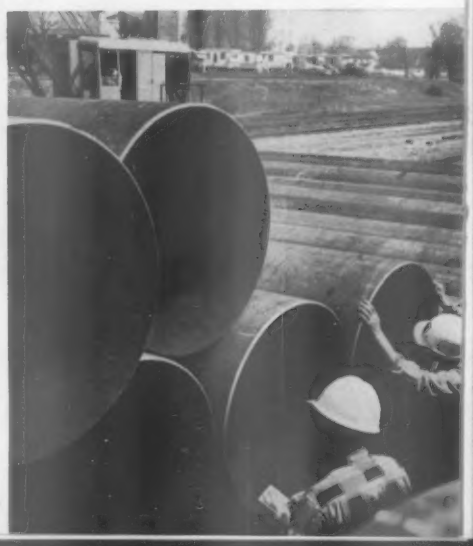
Steel pipe crosses the

Into the Bush Country sixty miles northwest of Corpus Christi, Houston Pipe Line Company trucked ton after ton of Bethlehem Steel line pipe. The pipe was true to round and bevel, so there were no delays as it was welded into a continuous length and buried in the sun-baked Texas soil. Only a few days were required to build the gas-tight pipeline now stretching from the town of George West to a tie-in line 25 miles west of Beeville.

Sheppard Geiger Construction Company, Corpus Christi, tested out the line at 1,050 psi on the first try, and Houston Pipe Line Company approved it for service, reinforcing major gas supplies for Houston Natural Gas System.

BETHLEHEM BUTTWELD LINE PIPE is also popular in the wide open Southwest. Here, Highlonesome Pipeline Company, Abilene, Texas, installs 3-in. Beth-Co-Weld plain end pipe 25 miles Northeast of Artesia, N. M. Engineered and designed by the Supply Division of Bethlehem Steel Company, the surface line will be a gathering system for Utex Exploration Company and Charles A. Steen of Moab, Utah.

Bethlehem continuous buttweld line pipe, manufactured in sizes from ½ in. to 4 in. (nom.) and in various lengths, can be counted on to meet required specifications.



BIG—BUT NOT THE BIGGEST. This is 36-in. OD electric fusion-weld line pipe, made for a number of Texas-based pipeline companies at our Steelton, Pa., pipe shop. Bethlehem supplies line pipe up to 42-in. OD with walls to ¾ in.

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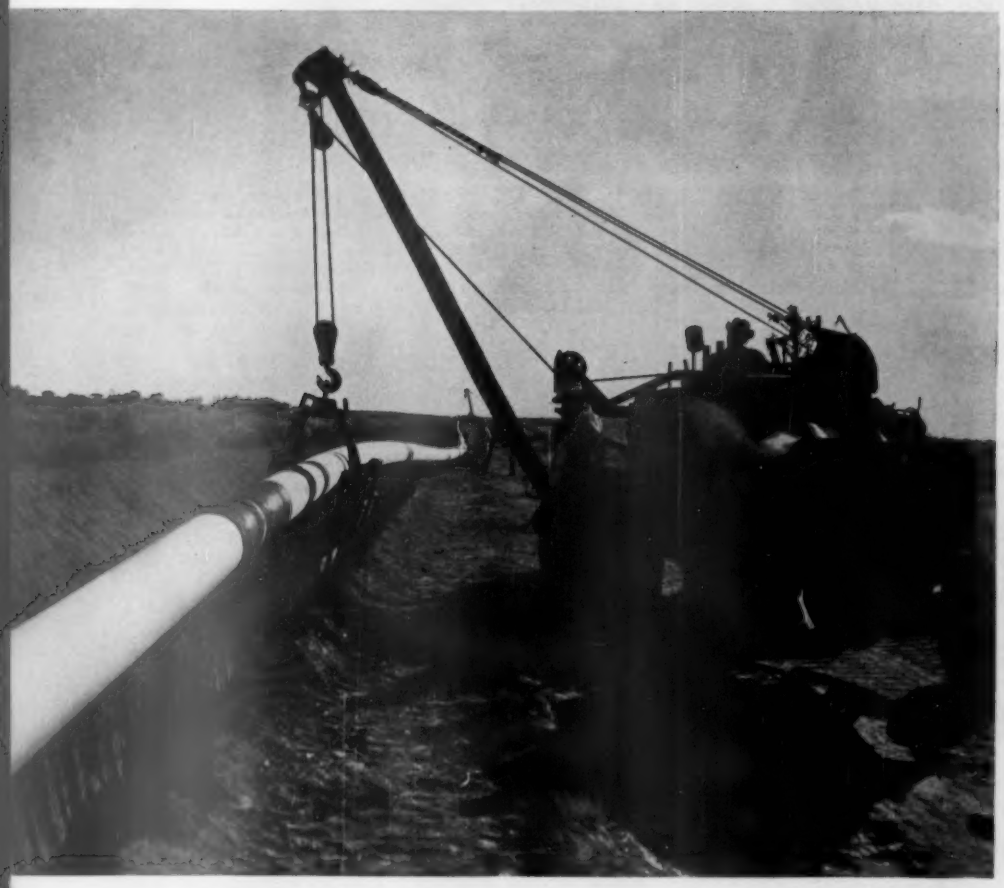

Bethlehem electric resistance-weld line pipe is a favorite down Texas way. We produce it to required specifications in sizes from 5-in. (nom.) to 16-in. OD, and in lengths to 60 ft. The steel pipe we furnished for this line was 12¾-in. OD x .250-in. wall, API 5L, Grade X-42.

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Among the Drilling Contractors

Helicopter aids Far North project

THIS IS THE SPOT where Mobil Oil Co. staked its 2 Great Basins well on the western frozen wastes of the Alaskan Peninsula. This well lies 14 miles northwest of the first well, and west of Becharof Lake in a 455,573-acre development block. Personnel shown are (from left): Willie Moore, helicopter pilot; Earl Walker, toolpusher for Rowan Drilling Co.; Richard Hulbert, Mobile equipment man; and Lionel Hammerson, Mobile mudman. The venture, originally scheduled for 6,000 ft., was drilled to a total depth of 8,865 ft. and was recently abandoned. Neither future plans nor what was encountered in the test has been disclosed by the operator.

Driller expands foreign operations

NEW DRILLING activities which have begun in three counties have been anonunced by Drilling and Exploration Co., Inc., Houston. Two of these are in the Eastern Hemisphere and one in the Western Hemisphere.

Kingdom of Libya . . . A National 80-B rig is being moved from Nigeria to Tripoli, Libya, under contract to Shell Oil Co. of Libya, N. V. Spudding is scheduled for about January 1, 1960. For this operation, an entirely new camp has been purchased and is now under construction. This operation is being handled through Drilexco's Dutch subsidiary, Drilvo.

Turkey . . . Drilexco moved its National 80-B from the Reyhanli location near the town of Antakya in southeastern Turkey, 450 km. to the Dudere location near the city of Adiyaman. The completion of the Dudere well marks the third well drilled for Esso in Turkey this year for a total of 23,511 ft. drilled and three moves.

Costa Rica . . . In the Republic of Costa Rica, near the city of Puerto Limon, Drilexco has recently spudded the second well being drilled under contract to Compania Petrolera de Costa Rica, Ltda., a subsidiary of Union Oil Co. of California. The contract provides that Drilexco furnish supervision and technical assistance for the drilling of exploratory wells. Equipment being used to drill this 15,000-ft. test is an Oilwell 96, which was shipped to Costa Rica earlier in the year.

Preplanned safety

Preplanned casing programs with prime consideration to possible blowouts and safety are the main reasons that Standard Oil Co. of California is leaving nothing to chance in a northern California venture. A projected 15,000-ft. well in the Rio Vista gas field of Solano County may set the depth record for the area.

Zones of trouble—gas blowouts—

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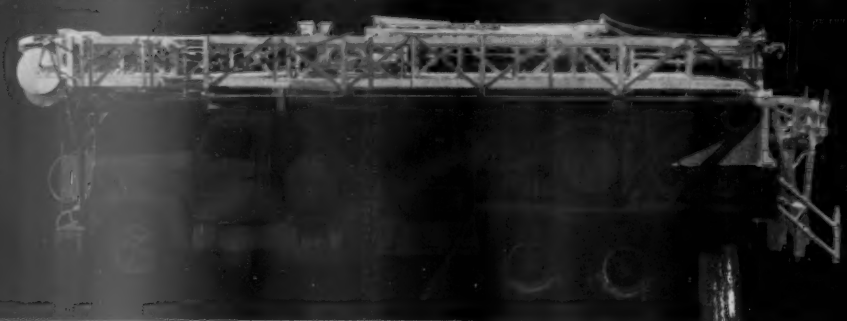

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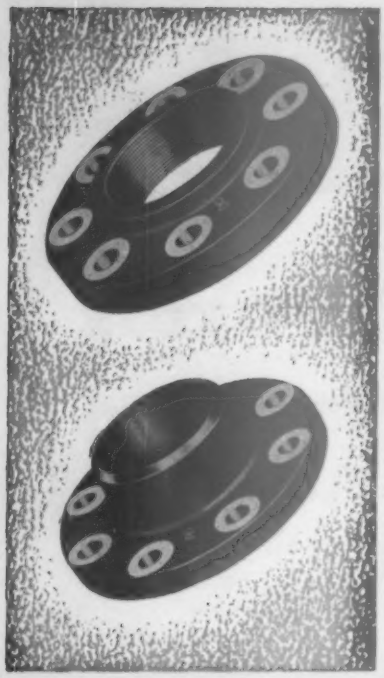

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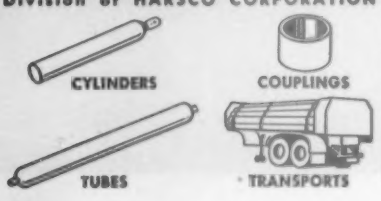

can occur at any depth from 1,200 ft. on down. A potential danger spot where high pressures have been experienced is the 3,500 to 4,000-ft. range. From that point anything can happen. Standard engineers have planned their casing program for optimum safety, and this is what is proposed:

Surface casing was 20-in. pipe set to 624 ft. Next, 13⅜-in. will go to approximately 5,000 ft. Below this 8⅝-in. pipe is planned to a depth of 10,000 to 11,000 ft.

In West Texas, the Phillips Petroleum Co.'s 1-EE University, Pecos County, was drilled to a total depth of 25,340 ft. last year. Surface casing was 20-in. to 1,480 ft., with additional strings of 13⅜-in. to 6,020 ft., 9⅝-in. to 10,996 ft., and 7⅝-in. to 22,919 ft.

The projected Rio Vista test by Standard would shatter the field's depth record of 11,051 ft. drilled in the Amerada Petroleum Corp.'s 4 McCormick. The objective may be the deepest exploratory penetration of the Cretaceous zone yet in northern California. In this likely gas province, Standard would readily accept an oil well. Company hopes are on the 11 Peter Cook which is located in 18-4n-3e. The well is being drilled by R. B. Montgomery Drilling, Inc., Bakersfield.

Rotary rigs up

IN A REPORT by Hughes Tool Co. for late November, an upswing in working strings is apparent. The total number in the country had risen from 2,159 to 2,206, an increase of 47 rigs. This may be partly due to the year-end flurry that is usually seasonal for the last quarter—or it may possibly be an indication of better things to come.

Louisiana headed the list with seven more than the preceding week. Other advances noted were: Kentucky (long a standard-tcol stronghold) up 7; Colorado up 6; Kansas up 13; Oklahoma ahead 7; and a gain in North Dakota of 4.

Declining states noted are Texas down 7—a loss of 10 rigs in West Texas were offset by slight gains in other Lone Star areas—and Illinois down 7. Wyoming maintained a fairly stable pace and was off one unit. In other less-fluctuating but active states the gains or losses were small.

Total rigs operating in the nation show a decided increase over a year ago. The variations generally tend to show increased interest in the Mid-Continent region and a decline in West Texas that may be temporary.

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To

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Drilling Company

P. O. Box 1108 Bristow, Oklahoma

Oras A. Shaw
President

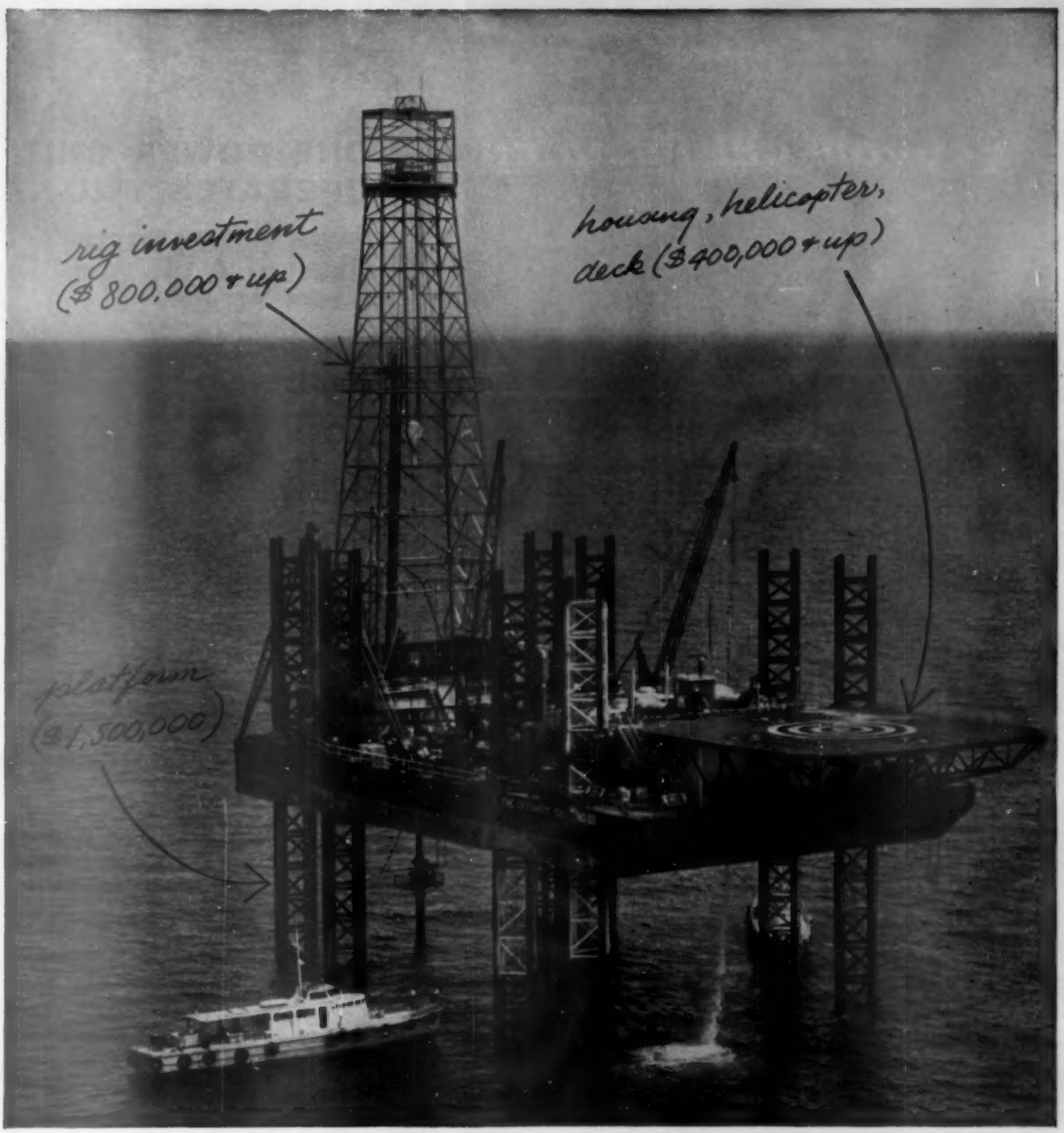
Wm. M. Hughes
V. P. & Gen. Mgr.

Elmer Cathey
Toolpusher

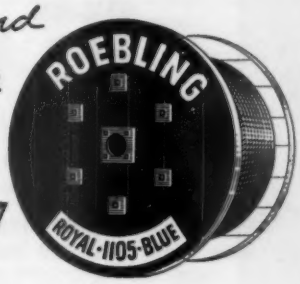
Earlier this year, the company acquired the one-third interest owned by Howard J. Doak, and the name is being changed to now show correct ownership. Shaw-Hughes Drilling Company, under the same management, will continue to operate with the same rigs and equipment, personnel, supervision, and policy. We shall try, as always, to give top performance in efficiency and cooperation.

Shaw-Hughes
Drilling Company

Formerly
DOAK DRILLING COMPANY



When you spend $4,000,000 for an offshore rig you can't afford not to use the best rope



You wouldn't use Bargain Basement bits. You'd get the best. You'd get the best of everything; that's why an offshore rig can run as much as $4,000,000.

To settle for anything less than Royal Blue at this stage would, indeed, be "pound foolish." For Roebling Royal Blue Wire Rope represents in *its* field, the finest there is.

It is made from the toughest rope wire ever produced—Type 1105—extra high-strength improved plow steel. Royal Blue has all the hard-working advantages of preformed construction; outstanding resistance to abrasion, fatigue, impact, crushing and shock; exceptional flexibility and ruggedness. Collectively, these values add up to 15% more strength than in any other rope you have ever used.

Anything less than Royal Blue can cost you *more*. Your distributor has Royal Blue right now. Get it now and save and save and save. For information on Royal Blue, write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

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2 EOT JOHNSTON PUMPING UNIT

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The EOT-Johnston Hydraulic Pumping Unit is the economical way to produce wells. Initial cost is less . . . installation cost is less than conventional beam-type units . . . and, as you can see from the field installation photo on the left, the power source is economical, too.

From Mexico to Canada, California to West Virginia, operators have field-tested the EOT unit. This ruggedly constructed pumping unit requires a minimum of maintenance, and in remote, inaccessible areas this is the pumping unit operators prefer because of its dependable performance. Compare cost or performance. The EOT-Johnston unit measures up!

Before you buy your next pumping unit, get all the facts and figures. Compare the initial cost, operating cost and proven performance of the EOT-Johnston pumping unit against conventional beam-type units. You will see why profit-minded operators specify EOT-Johnston Hydraulic Pumping Units when their wells go on artificial lift.

Aerial photo (left) shows the Sohio Petroleum Co.'s EOT-Johnston pump installations. Located on the banks of the Atchafalaya River in the St. Martin Parish, La.; the two units are driven by one 84 h.p. prime mover using gas from the wellhead. The two pumping units are 1000 feet apart in this remote location.

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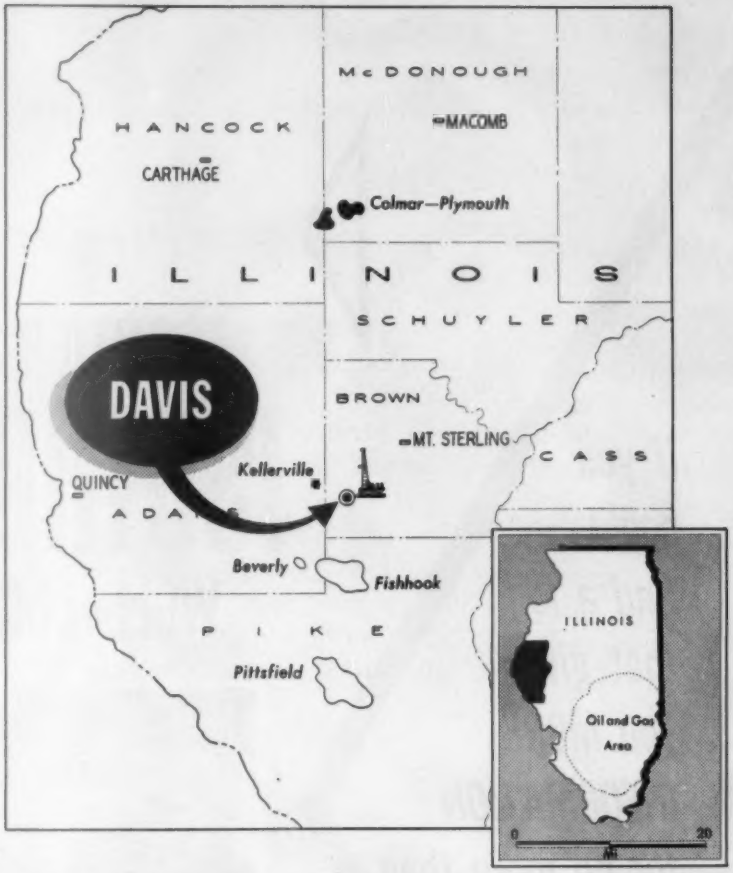

WESTERN ILLINOIS is agog over a new oil field in Brown County on the western flank of the Illinois basin. A minor boom has been set in motion by the success of Charles Eager 1 Davis.

Western Illinois strike lures independents

BY FRANK J. GARDNER

ONE OF THE most interesting exploration stories of the year is being written today in Brown County, Illinois. In a setting far removed from the main oil and gas areas of the state, an independent operator has found a shallow oil pool and launched a drilling play that now involves 11 active rigs within a 2-mile radius of the discovery, now unofficially named Siloam.

It all began about a month ago when Charles Eager brought in his 1 W. L. Davis, Section 8-2s-4w, as a 1,005-bbl. oiler from 8 in. of Edgewood-Silurian lime between 634 and 635 ft. Two weeks after the first gage, the well was averaging 400 bbl. a day of 35° oil; officially, the initial potential reads 576 bbl. daily on pump. There was no water, and the well was completed without any kind of treatment.

A tempting objective . . . News of the strike, of course, triggered the usual flurry of leasing and dealing. Not since the first Green County, Kentucky, boom had tristate independents had such a tempting target put before them. Here was a shallow, prolific oil reservoir calling for minimum drilling effort and expense. Today, a dozen or more operators are sinking cable-tool holes in search of this reservoir.

The score so far is none too good—three dry holes and one apparent success not comparable to the discovery well. The three failures, however, are all south of the Davis well; the producer lies northwest of it. Outcome of wells now drilling to the north will determine the real importance of the Siloam pool. The one apparent success is R. L. Moore 1 Robinson in Section 8-2s-4w; it is now being put on pump for final tests.

Obviously, Charles Eager has uncovered a tricky stratigraphic trap in western Illinois, 70 miles away from the principal oil area of the state. In all three of the failures to the south of the discovery, operators have reported the Silurian as "nonporous"; one of them topped the Silurian 110 ft. higher than Eager's well. The Moore 1 Robinson apparent producer reports the top 65 ft. higher. Evidently, the field lies to the north and east, and only future tests will reveal its size.

Points to the west . . . The significance of the find, however, lies neither in size nor in productivity. Rather, in its position on the western flank of the Illinois basin. About a year ago, these pages tried to direct attention to the possibilities of this western region *(OGJ, December 1, 1958, p. 166)*. Gas was first discovered here in 1886 at Pittsfield (see map), since abandoned. Oil was found in 1914 at Colmar-Plymouth, where about 5 million barrels of Devonian oil has been produced.

More recently, in 1955, the Fishhook gas field was opened in Pike and Adams counties, 8 miles south of the new oil field. Here, 60 or more gas wells stand shut in for lack of outlet; they have an average daily capacity per well of 624 M.c.f. gas, with the Silurian-Edgewood reservoir lying at 487 ft. All in all, a 10-billion-cubic-foot reserve has been estimated for Fishhook. It was discovered by random drilling, but a glance at any topographic map reveals the 8-mile-long Fishhook anticline.

How many more Fishhooks and Siloams lie undetected in western Illinois? Scores, probably. We don't know why Charles Eager drilled where he did, but it's reasonably sure that a little positive thinking and some sharp observation can turn up a lot more Silurian fields in this region. Fishhook could have been found by studying the stream patterns of northern Pike County—look at your topographic map sometime. Or order one from the Illinois State Geological Survey.

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FRONTIER'S ISOTRON® WELL LOG

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Unlike several other similar logging tools which are in various stages of development, Frontier's ISOTRON has seen actual field service . . . over 1,500 downhole jobs, with a batting average of .820 successful completions. Because it reads through casing, it has proved extremely effective in the re-evaluation of plugged wells or low producers. In many instances, as a result of the additional information which only ISOTRON can provide, wells have been successfully recompleted for volume production.

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You can buy a 3-curve ISOTRON log for no more than you pay for an ordinary 2-curve gamma ray-neutron log! Until now, ISOTRON required two trips downhole to obtain its data. This, we frankly admit, made it rather expensive . . . one of the major obstacles to its more widespread use. Well, we've whipped the problem. Now, ISOTRON delivers 33⅓% MORE INFORMATION than any other log, with ONE TRIP INTO THE HOLE . . . effecting enough saving in time and operating costs that it can now be offered at a competitive price.

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Let's get down to cases as to what Frontier's ISOTRON can do for *you!* As you know, the ordinary gamma ray-neutron log provides only two curves . . . one, a sand/shale indication and the other, a porosity indication based on the slowing down of neutrons by hydrogen atoms. Such a log can locate fluid but cannot identify it. Frontier's ISOTRON employs a *third* curve based on the response of chlorine in sedimentary rock.

Being present in water but not in oil, chlorine is uniquely definitive in determining fluid type. By normalizing for both chlorine and hydrogen content through known saltwater zones of varying porosities, a median response to each element is established and the readings made to coincide. Subsequently, separations occur between the two curves in any zones where (a) chlorine content drops appreciably, a valid indication of oil, or (b) fluid saturation decreases, denoting positive gas saturation. In either case, the degree of separation is indicative of the ratio of oil or gas to water. The result is a reading basically much more sound than has heretofore been possible with any one type of log, either electric or nuclear.

For the complete story on ISOTRON, call or write for illustrated brochure. Do it now!

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....the MORE you have, the BETTER your chances

TREMENDOUS STRUCTURES of Arkoma basin are seen in this aerial photo. Fig. 1.

Arkoma slated for big drilling action

Prospects are that Arkoma basin will prove to be a huge gas reserve—perhaps second only to Hugoton—in the Mid-Continent area

WILLIAM A. ROSE
Carter Oil Co., Fort Smith

AND

PETER B. BIKE
Geophysical Editor

GROWING GAS PROVINCE is apparent by these fields. Circled gray are new 1959 pools. Other gray fields are 1958 strikes. Fig. 2.

IT'S NO WONDER that Northwest Arkansas has drawn much recent interest—more than 75 known surface anticlines exist in the eastern portion of the two-state Arkoma basin. Two of these, Ranger and Washburn anticlines, are over 40 miles long. Washburn has production while Ranger, with but two tests on it, has yet to score.

This part of the state is not oil country—only dry gas has been found within its boundaries. The Arkansas sector of the Arkoma basin is bounded on the north by the Boston Mountains, on the east by the Gulf Coastal Plain (Mississippian Embayment), and on the south by the Ouachita Mountains.

Looking at the aerial photo (above), it is apparent that the abundant structures are textbook in scope. This is misleading because the geology is quite complex. Faulting, both normal and thrust, abounds. Reasons for difficulty in interpreting the subsurface are due to prevalent unconformities, discontinuous pays, and offset in structure with depth.

The drilling density for the whole area is relatively low. Take the Ranger Anticline for example; the only two wells shown have been finaled at depths of 4,777 and 6,011 ft.

Stratigraphic sequence . . . Presently, the Pennsylvanian section is the main productive zone. Depth considerations have limited most of the drilling

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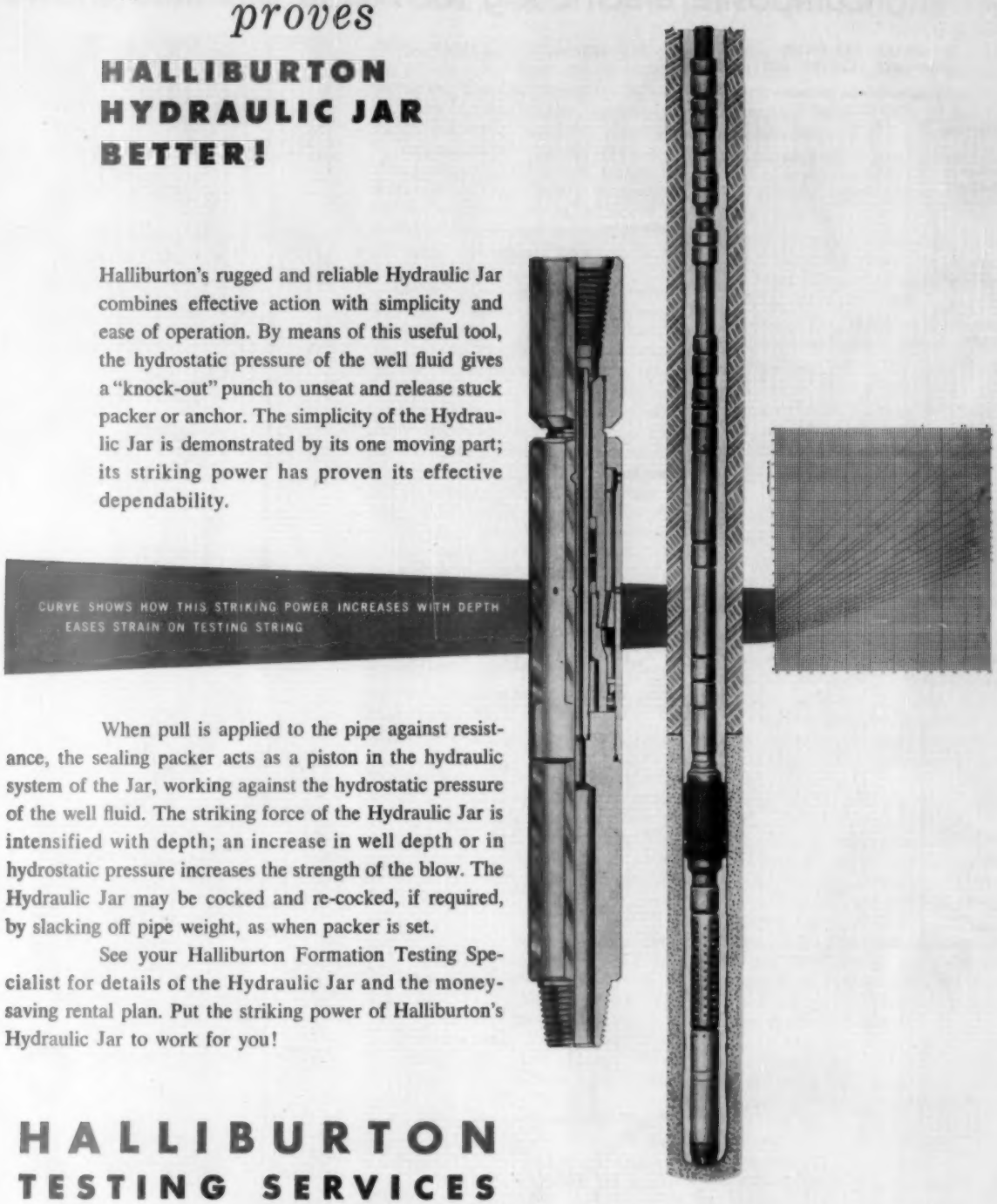
Halliburton's rugged and reliable Hydraulic Jar combines effective action with simplicity and ease of operation. By means of this useful tool, the hydrostatic pressure of the well fluid gives a "knock-out" punch to unseat and release stuck packer or anchor. The simplicity of the Hydraulic Jar is demonstrated by its one moving part; its striking power has proven its effective dependability.



When pull is applied to the pipe against resistance, the sealing packer acts as a piston in the hydraulic system of the Jar, working against the hydrostatic pressure of the well fluid. The striking force of the Hydraulic Jar is intensified with depth; an increase in well depth or in hydrostatic pressure increases the strength of the blow. The Hydraulic Jar may be cocked and re-cocked, if required, by slacking off pipe weight, as when packer is set.

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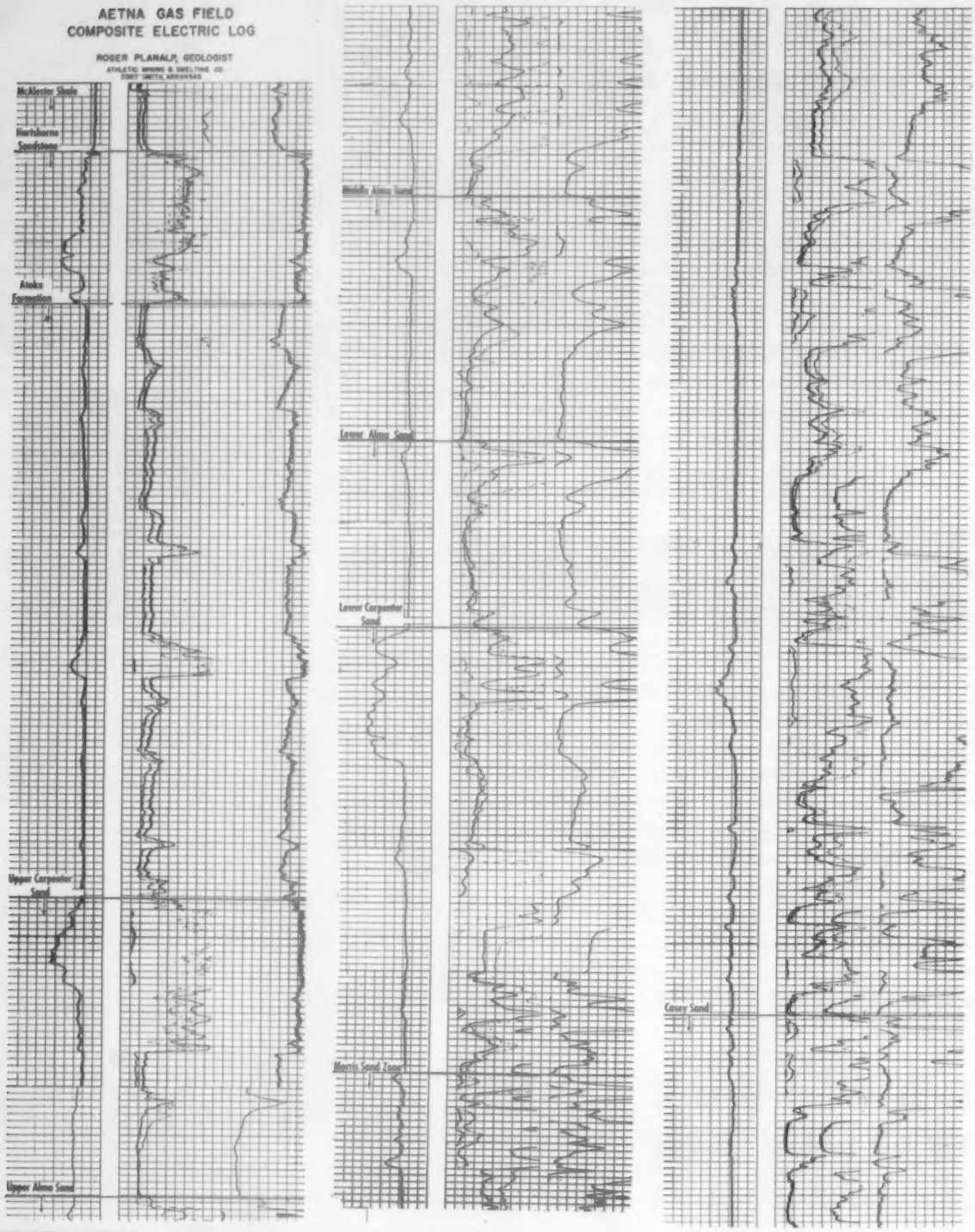
Composite electric log for Aetna gas field shows

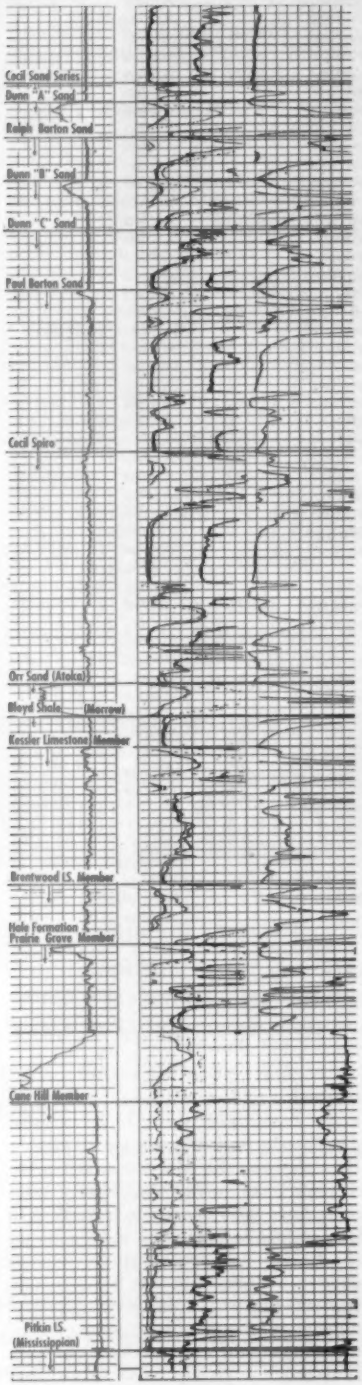


PENNSYLVANIAN section draws brunt of interest . . .

in Arkoma basin due to depth considerations . . .

and the fact that most production is from these beds . . .

Atoka, Kessler, Brentwood, and Hale pay formations



with many possible pays in the thick Atoka. Fig. 3.

to the Pennsylvanian and the economics of the older beds are practically unknown. The pay formations include the thick Atoka, Kessler, Brentwood, Hale, and their respective members. A generalized electric-log section is seen in Fig. 3. Estimates of maximum thickness of sedimentary section in the Arkoma basin are up to 30,000 ft. In the southwest area the Atoka, longest single section, is believed to be 12,000 ft. thick.

Generally, except for local undulations, the regional dip is to the south with the deep of the synclinorium at the regional interface of the Ouachita Mountains' north boundary. The sands are not usually continuous, but appear to come and go inconsistently. Although this affords a multiplicity of targets and opportunity to hit several pays in a single test, the gas horizons are difficult to predict. The Atoka is the leading reservoir—probably due to its great thickness. The potential of any horizon is tricky to calculate. Low-pressure sands have yielded high volumes and conversely high pressures have resulted in low volumes. About the only generality that can be made is that the wells have usually long lives. If more precise estimates of reserves could be made, the area probably would have greater pipeline facilities than are afforded now.

New strikes . . . In 1958, there were seven new gas fields discovered in the valley, along with four extensions of new pays in the proven fields. This year nine new pools have been found through late November. These new fields are:

Dover field, Pope County, Bert Wheeler & Carter Oil Co. 1 Johnson, 24-9n-20w; pay: Barton A 3,830-53 ft.; Allen B 3,380-3,403 ft.; 14 M.M.c.f.

Delaware field, Yell County, Shell Oil Co. 1 Thos. Jones, 19-7n-21w, pay: Tackett sand 3,882-4,065 ft.; 285 M.c.f.

Quitman field, Cleburne County, Beard Oil Co. 1 Evans, 32-9n-11w, pay: McGuire (Atoka) 1,956-58 ft., 1,968-76 ft., 1,990-98 ft.; 500 M.c.f.

Barnes field, Franklin County, Arkansas Western Gas Co., 20-11n-26w, pay: Atoka 1,776-90 ft., 1,795-1,811 ft., 2,018-26 ft.; 4,210 M.c.f.

Brentwood field, Washington County, Arkansas Western Gas Co. 1 Goad, 20-14n-29w, pay: Wedington (?) sand 565-650 ft.; 460 M.c.f. Note: If this is Wedington sand, it is Mississippian production on the fringe of the Arkoma basin.

Magazine field, Logan County, Anderson-Prichard Oil Co. 1, Birch, 2-6n-27w, pay: Atoka 5,818-23 ft.; 554 M.c.f.

North Knoxville field, Pope County, Gulf Oil Corp. 1 Bauman, 13-9n-22w, pay: McGuire (Atoka) 4,531-38 ft.; 5 M.M.c.f.

Unnamed field, Logan County, Anderson-Prichard Oil Co. 1 Beth Williams, 7-6n-27w, pay: Atoka 1,131-1,368 ft.; 409 M.c.f.

Unnamed field, Franklin County, Gulf Oil Corp. 1 Dunn, 24-8n-28w, pay: second Hale, 7,606-32 ft.; 760 M.c.f.

Thus in a 2-year period, 20 new producing areas have been uncovered. It is significant to note that not all the new strikes have been along the "fairway," but several were remote from previous production. Quitman is the easternmost production and brought Cleburne County into the producing ranks. To the north along the Arkoma-Ozark province interface, Brentwood was discovered southeast of West Fork in Washington County. Another stepout was at Delaware in Yell County.

During 1957, 29 gas fields produced 17,800 M.M.c.f. of gas, and during 1958, 32 fields produced slightly less than 23,500 M.M.c.f.; 6 fields without pipeline connections were shut in. The increase here in annual production from 1957 to 1958 was roughly 32%. The older, more prominent gas fields having an accumulative production in excess of 6,000 M.M.c.f. of gas in Northwest Arkansas are shown in Table 1.

The newer, more prominent gas fields which have had confirmation tests and have been discovered within the past 5½ years, are as follows:

Field	County
Moreland	Pope
Jerusalem	Conway
Gragg	Sebastian
Knoxville	Johnson
Union City	Johnson
Spadra	Logan
Coal Hill	Johnson
Aetna	Franklin

Drilling is a problem . . . Since the first production was discovered on the

Mansfield structure in eastern Sebastian County in 1902, the cable tool has been a favorite method of Arkansas operators. With the advent of the rotary, cable tools were used to optimum depths, and then the rotary conventional-method rigs were used. The digging is tough, and with alternating sections of shale and hard limes and sands, rotary methods were not generally adaptable to the area.

In 1953, experimentation with rotary-air rigs and rotary-gas drilling enhanced the potential of more rotary use for deeper drilling. Another modification is the use of percussion-type bits and button bits to overcome the hard formations. The chief objection to conventional rotary-mud drilling is the very low penetration rates. Some operators still prefer to use cable tools from surface to total depth. Others use rotaries (air and gas) from surface to total depth, preferably where no water sands are encountered.

The basic problem of all drilling methods is water sands. Cable-tool drillers circumvent this problem by the use of casing and continual reduction of hole size. The several options of rotary operators have included mist drilling, water-shutoff chemicals, and intermediate casing. Preplanning of the casing program is pertinent because of the inconsistency of finding the porous zones at their anticipated levels. It is not uncommon to encounter water sands with the gas sand immediately below it. The use of air drilling, button bits, and percussion bits involved higher costs, but in most cases the results justify the added expense.

Average depth of all wells drilled within the basin during the 2-year period of 1957 and 1958 was 4,900 ft. In 1958, the average drilling depth was 5,700 ft. These figures include both wildcat and development wells.

TABLE 1—GAS FIELDS IN NORTHWEST ARKANSAS

Disc. Date	Field	County	Pay
1902	Mansfield	Sebastian, Scott	Atoka
1904	Massard*	Sebastian	Atoka-Spiro, Hale
1904	Massard-Prairie*	Sebastian	Atoka
1915	Kibler*	Crawford	Atoka-Spiro
1916	Alma*	Crawford	Atoka
1918	Williams	Franklin	Atoka
1919	Williams, deep	Franklin	Atoka
1920	Section Ten	Crawford	Atoka
1921	Lavaca	Sebastian	Atoka
1922	Alma, deep	Crawford	Atoka
1926	Clarksville*	Johnson	Atoka
1927	Greenwood Junction	Crawford	Atoka
1927	Shibley	Crawford	Atoka
1928	Aetna	Franklin	U Atoka
1929	Tates Island*	Pope	Atoka
1930	Ozark, deep	Franklin	Atoka
1932	Vesta	Franklin	Atoka
1936	Ewing	Sebastian	Atoka
1937	Beverly	Franklin	Atoka
1937	Beverly	Sebastian, Franklin	Atoka
1937	Ozark Anderson	Franklin	Anderson-Atoka
1938	Clark, shallow	Franklin	Atoka
1942	Silex	Pope	Atoka
1943	White Oak*	Franklin	Atoka, Hale
1945	Bloomer	Sebastian	Atoka
1949	Cecil*	Franklin	Atoka, Hale
1949	Rudy	Crawford	Atoka, Hale
1950	Lone Elm*	Franklin	Atoka
1951	Low Gap	Johnson	Atoka
1952	Linville	Johnson	Atoka
1953	Watula	Franklin	Atoka, Hale
1953	West Fork	Washington	Sylamore
1954	Moreland	Pope	Atoka, U Morrow, Woolsey
1955	Jethro	Franklin	Atoka, Hale
1956	Gragg	Sebastian	Atoka
1956	Jerusalem	Conway	Allen, Barton
1957	Knoxville	Johnson	Atoka
1958	Old Hickory	Conway	Atoka
1958	Hollis Lake	Crawford	Atoka
1958	Coal Hill	Johnson	Atoka
1958	Union City	Johnson	Atoka
1958	Booneville (Washburn)	Logan	Atoka
1958	Paris	Logan	Morrow
1958	Spadra	Logan	Atoka
1959	Barnes	Franklin	Atoka
1959	Brentwood	Washington	Wedington (?)
1959	Delaware	Yell	Tackett sd.
1959	Dover	Pope	Allen B, Barton A
1959	North Knoxville	Pope	McGuire (Atoka)
1959	Magazine	Logan	Atoka
1959	Quitman	Cleburne	McGuire (Atoka)
1959	Unnamed (And-Prich. 1 Williams 7-6n-27w)	Logan	Atoka
1959	Unnamed (Gulf 1 Dunn 24-8n-28w)	Franklin	2nd Hale

*Indicates prominent fields having accumulated production of 6,000 M.M.c.f. or more. (Note: All new pays in old fields are not shown).

. . . Pipeline facilities are getting better each year as greater interest is shown in northwestern Arkansas. At the end of 1958 there were six fields shut in due to lack of pipeline facilities. Present carriers serving the area include Arkansas Louisiana Gas Co. (Arkla) and Arkansas Western Gas Co. A 16-in. line by Arkla runs from the heart of the fairway southeast to Helena. Another line (10-in.) serves the eastern portion of the basin with the outlet direct to Little Rock. Arkwest has a parallel system serving Fayetteville and environs. Earlier this spring accelerated interest was indicated in the future potential of the area. Three gas companies made preliminary surveys to determine whether the area affords sufficient production to justify additional lines.

. . . Leases are still available although 75% of the area is under lease. Considerable leasing has occurred during the past 3 years. The principal leaseholders are: Arkansas Louisiana Gas Co., Arkansas Western Gas Co., Carter Oil Co., Continental Oil Co., Gulf Oil Corp., Mobil Oil Co., Murphy Corp., Ohio Oil Co., Panhandle Eastern Pipe Line Co., Pecos Exploration Co., Phillips Petroleum Co., Pure Oil Co., Reynolds Mining Co., Shell Oil Co., Stephens Production Co., DX Sunray Oil Co., and Tennessee Gas Co.

Despite these leaseholds by some of the larger companies, opportunities exist for the smaller operators to obtain equitable farmouts.

Outlook . . . Prospects are that the Arkoma basin will prove to be a huge gas reserve—perhaps second only to Hugoton—in the Mid-Continent area. Actually, the surface has barely been scratched. Well density is low. With a tremendous sedimentary section of up to 30,000 ft. and average drilling depths less than 6,000 ft. to date, one can say that the area is virtually untapped. Only this year, southeast of the Aetna field in Franklin County, a four-zone pay was discovered and completed as a quadruple producer. Operated by Athletic Mining & Smelting Co., this venture, the 1 Ernest Carpenter, was a joint effort of Continental Oil Co., Carter Oil Co., and Stephens Production Co. Ultimate po-

tential was gaged conservatively at 12 M.M.c.f. with the deepest pay less than 7,000 ft. More drilling will come to Arkansas. There are many prominent features that are presently untested. Any area that has 75 known anticlines will attract greater attention, and northwest Arkansas will live up to its name as the Wonder State.

Acknowledgments

Charles S. Bartlett, Gulf Oil Corp., Fort Smith, granted permission to use the aerial photo, which was annotated by him and presented in the Fort Smith Geological Society guidebook on western Arkansas. The aerial-photo mosaic was prepared by Tobin Aerial Surveys, San Antonio.

Roger Planalp of the Athletic Mining & Smelting Co., Fort Smith, prepared the generalized electric-log section used in this article. It, too, was part of the guidebook.

Two excellent and recent references for background data on Northwest Arkansas are: "Subsurface Geology of Northwestern Arkansas" by William M. Caplan, Information Circular 19, Arkansas Geological & Conservation Commission, Little Rock, 1957; and "Guidebook of the First Regional Conference, Western Portion of Arkansas Valley Basin," Fort Smith Geological Society, Fort Smith, April 1959. The guidebook can be obtained from Box 137, Sta. A, Fort Smith.

Sooner's Dewey adds well

Dewey County's Putnam field in western Oklahoma gained its fourth producing well at Union Oil Co. of California 1 Robertson, C NE SW 9-16n-17w.

The well flowed 2,500 M.c.f.d. and 312 bbl. of condensate on test through ½-in. choke from Oswego perforations at 9,532-94 ft. Oswego is Pennsylvanian.

... **Mobil Oil Co.** 1 Herring in C SE NW 22-16n-16w flowed 1,100 M.c.f.d. on 12/64-in. choke from perforations in the Hunton lime at 14,210-14,230 ft. and 14,320-38 ft.

Alaskan wildcat is abandoned

The second well by General Petroleum Corp., 2 Great Basins, was abandoned November 14 in Alaska. Total depth is 8,865 ft.

This wildcat was located on a 455,573-acre contract development area on the west side of the Alaska Peninsula near Becharof Lake. The first well in the area was plugged in September at 11,080 ft.

Other activity . . . At Nulato Unit, Benedum and Associates' first wildcat in the Kateel basin will be spudded soon. It is the 1 Nulato.

● Swanson River. Standard-Richfield's operations here include 12-27 Swanson River which is being tested in the Hemlock zone. Total depth is 11,500 ft. The 32-22 well was spudded early in November and is below 5,647 ft. The 1-4 well on the Soldatna Unit will be spudded as soon as road is completed to drill site.

● Union-Ohio's 34-31 well is being tested for gas. Total depth is 5,809 ft. There are reports that a third drill site is being prepared.

● Alaska Consolidated 1 Zappa was suspended at 11,200 ft. There are reports that fishing is now under way at 11,170 ft.

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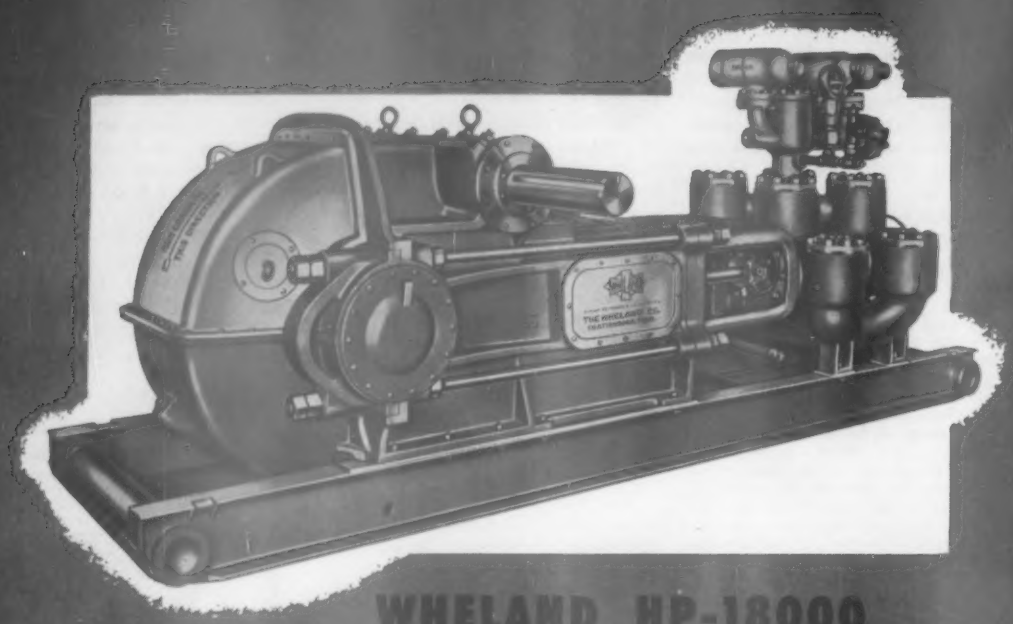

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Maritimes may yield to oil hunters

CANADA'S Maritime Provinces have long been a sad hunting ground for oil with production in only one—New Brunswick. Exploration men have probed the provinces for many years, but went away with dry-hole memories. This winter will see another chapter written into the exploratory history of Cape Breton Island in Nova Scotia and on forlorn Sable Island out in the Atlantic Ocean.

After a century

. . . of oil hunting in Nova Scotia, there still is no production. Drilling operations began in October at Imperial Oil's first wildcat in Cape Breton Island. The 1 Mabou is located about 5 miles south of the village of Mabou on the west side of the island.

This Inverness County wildcat will be watched closely by Maritimes drillers and indeed the entire wildcat business. Since 1900 a dozen wildcats have been drilled on Cape Breton, but with little encouragement. Imperial put down two wells on the Nova Scotia mainland during the 1930's, and has drilled nine wells in Prince Edward Island and New Brunswick during its current wildcat campaign in the Maritimes. They began the program in 1956 when geological and geophysical surveys were begun on Prince Edward Island. These surveys have since been carried out in all three provinces. The company began drilling on Prince Edward Island last year, continuing in New Brunswick during the first part of this year.

Imperial plans to drill all winter at the Cape Breton wildcat with compressed air rotary equipment. This equipment was used in Western Canada before being moved to the Maritimes where they completed a dry hole at Port Elgin, New Brunswick at 3,025 ft.

Despite no oil production

. . . three-fourths of the potential oil areas in Nova Scotia are now tied up by licenses. This is about one-third of the province. Imperial, Mobil Oil of Canada, R. H. Hedge, William Bridewell, D. A. MacInnis, Thomas Jordan, and Lura Corp. all have licenses. These are valid for 5 years, require spending $32 per mining tract, or 1 square mile, the first year, $51 the second year, $77 the third, $128 the fourth, and $160 the fifth years. Leases would have to be secured to operate in case of discoveries.

Nova Scotia looks good

. . . for oil discovery. Several provincial areas have prospects of being oil reservoirs. The Hants, Pictou, and Cumberland County section of the province have had promising oil shows in the past. There is similar evidence in Antigonish County, the Sydney basinal area, and out on Sable Island in the Atlantic Ocean where Mobil Oil is working.

Interest should be centered on the sedimentary rocks of Mississippian age which underlie most of northern Nova Scotia, eastern New Brunswick, and Prince Edward Island. There are numerous seeps and oil showings around the Maritimes. The big problem is to find reservoir rocks entrapped. Favorable structural-stratigraphic combinations plus the evidence of oil put the Maritimes in a respectable position for discoveries. The basins are there, the sediments are there—all that is needed is a spirited wildcat campaign.

Mixed oil emotions

. . . face those hunting for oil in Nova Scotia. Many people would rather not see oil found here because of the failing coal industry. Some would rather see a gas discovery to entice possible new industry to the island. Should oil be found on the island, no individual land owner would get rich quick. The government passed legislation a long time ago reverting all mineral rights to the Crown.

Oil in Nova Scotia would mean stopping imports from Venezuela which provides most of the 45,000 bbl. used per day in the Atlantic Provinces, and another 40,000 expected to be brought in soon. The important Mabou wildcat now underway will be the subject of much oil conversation this winter.

—John C. McCaslin

Geologists, engineers, and geophysicists study

Fluid movement in rocks

A two-day conference on fluids in rocks, analyzing the movement of oil, gas, and water in porous rocks and soils, will be held Jan. 29 and 30 at the University of California, Los Angeles.

Discussion will center on the fundamentals and on new approaches and tools for solving water, oil and gas problems, according to Dr. John C. Crowell, chairman of the UCLA geology department.

The conference, sponsored by the UCLA departments of geology and engineering and university extension, will allow an exchange of views among petroleum, water, and foundation geologists; reservoir, foundation, and construction engineers; and hydrologists and exploration geophysicists

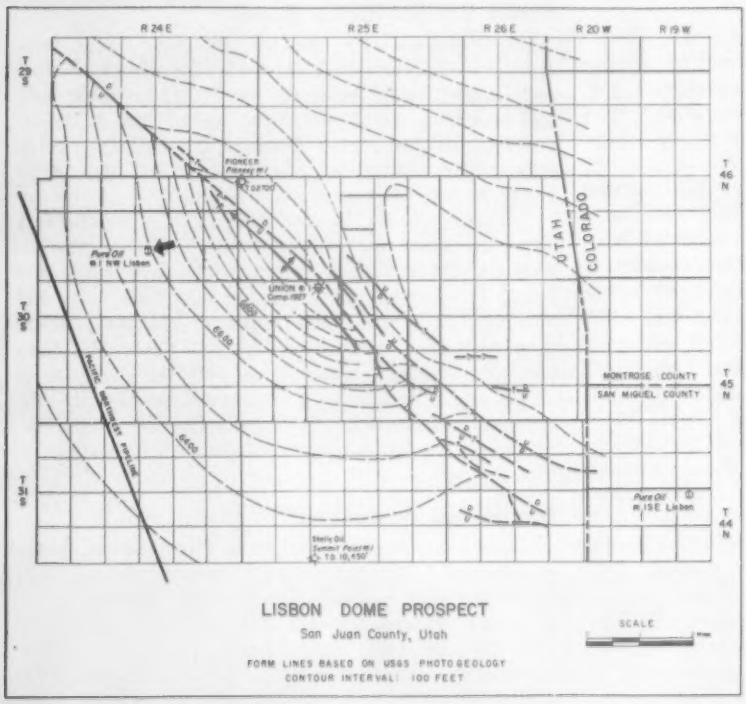
Speakers will include Gilman A. Hill, president of Petroleum Research Corp., Denver; H. E. Skibitzke, U. S. Geological Survey; Robert Thomas, California State Department of Water Resources; Gerald W. Johnson, associate director of Lawrence Radiation Laboratory; and UCLA professors Martin R. Huberty, George C. Kennedy and U. S. Grant.

Information and registration forms may be obtained from Engineering Extension, University of California, Los Angeles 24.

Paloma area yields new California discovery

An area between the Paloma and Ten Section fields in Kern County turned up a new field discovery by Tidewater Oil Co. Tidewater moved onto a location 2½ miles southeast of Ten Section and 3½ miles northeast of Paloma for the find. Drilled to 9,050 ft., the well tested at a rate of 700 bbl. daily of 34°-gravity crude from a formation at 8,931-9,014 ft.

This wildcat, 86-3 KCL, was originally scheduled as a 13,000-ft. test. It is approximately 900 ft. north of an 11,010-ft. wildcat drilled by Tidewater in September.



Key wells testing in Rockies

HERE IS THE MOST IMPORTANT DISCOVERY AREA of the year in the Rocky Mountain province—Northwest Lisbon. Pure Oil Co. has run pipe and is preparing to test its Mississippian-Devonian discovery in San Juan County, Utah. Swab tests at the Southeast Lisbon wildcat in San Miguel County, Colorado, are in progress, but no commercial results are reported as yet. The map shows the relation of Pure's two wildcats to the Lisbon Valley-Dolores anticline, a salt-core anticline that runs parallel to the Uncompahgre uplift which is the eastern limit of the Paradox basin. Note the proximity of the discovery area to the Pacific Northwest Pipeline. (Map courtesy "Oil News," Albuquerque.)

Desert test drilling ahead in California

The state's remotest wildcat, Sierra Oil & Gas Co.'s test 25 miles east of the desert community of Barstow in San Bernardino County was drilling ahead below 6,000 ft. This test earns its wildest-wildcat rating by being more than 100 miles from nearest production in the state.

Refugio Cove gas discovery reperforated

In California, Sunray Mid-Continent Oil Co. has moved back into its Refugio Cove gas field find of July 1958, and reperforated additional zone. The well made 3,900 M.c.f.d. from 3,509-17 ft. when originally completed. It also produced about 7 bbl. daily of 63.1°-gravity condensate.

Sunray perforated additional zones at 3,503-09 ft. and 3,524-56 ft. recently and reported production of 948 M.c.f.d. and 5 bbl. daily of condensate.

This one-well field is 2 miles west of the old Capitan field in Santa Barbara County and only a little more than ½ mile from the coast.

Big discovery for Colorado's Paradox

THE COLORADO PORTION of the Paradox basin has its most important discovery since Towaoc and Flodine Park were opened late last year. Phillips Petroleum Co. 2 Desert Canyon in 11-34n-20w, Montezuma County, flowed 280 bbl. of oil daily from Paradox Pennsylvanian at 5,902-17 ft. Gage was on ¾-in. choke.

This newest Pennsylvanian producer in southwestern Colorado is 5½ miles south of Flodine Park, 1½ north of Marble Wash (the opener of Pennsylvanian production in the Colorado portion of the basin), and about 2 miles north of Towaoc field (the biggest producer on the Colorado side).

The 2 Desert Canyon was drilled by Calvert Drilling Co., and taken over by Phillips for completion.

Second find . . . Another good discovery is reported in Montezuma County. It is Hathaway Co. and Big Horn Powder River Corp.'s 4 USC in NW SE 11-37n-20w.

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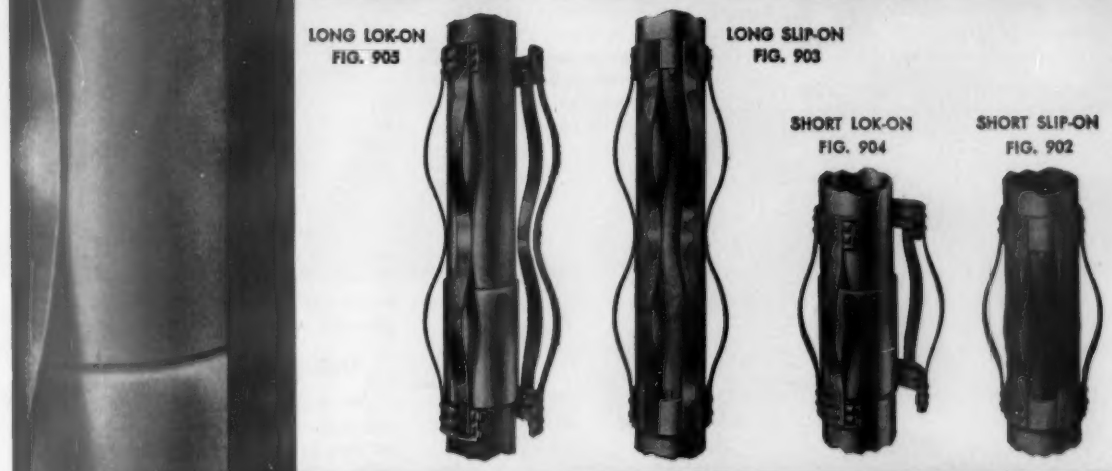

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Exploration in Mexico keeps pace with needs

SEISMIC CREWS operating in the Tampico area looks like this. Of 18 active seismology crews, one worked this year in offshore operations in the Gulf of Mexico

BY ANTONIO GARCIA ROJAS

AS IN PREVIOUS YEARS, exploration activities of Petroleos Mexicanos during 1958 and the first 6 months of 1959 were concentrated in the coastal area of the Gulf of Mexico. This region contains Mexico's northern states of Chihuahua and Coahuila.

The author is exploration manager for Petroleos Mexicanos with offices in Mexico City.

During 1958, a total of 45 field parties operated in Mexico. Of these, 22 were surface-geology crews, 18 were doing seismic work and 5 were gravity-meter crews. The seismic operations included a marine crew which covered the Continental Shelf next to the coastal plains of Tabasco and the southern part of Veracruz. A total of 501 crews-months were employed in both geological and geophysical work.

Drilling and New Discoveries

On the basis of data supplied by the geological and geophysical parties as well as information gathered from drilling operations, studies of regional geology, paleography and sedimentology have been made. As a result, exploratory drilling has been conducted in recent years to test older and deeper formations than those which traditionally have been producing oil in Mexico.

The average well depth has thus been increased from 5,294 ft. in 1954 to 6,958 ft. in 1958. The total number of wells drilled per year has fluctuated between 350 and 400 in the last 5 years. However, total footage per year has been steadily increasing during the same period.

During this 5-year period, a total of 325 new-field wildcats have been drilled in Mexico. This drilling has resulted in the discovery of 67 new oil and gas producing fields. In 1958, 55 exploratory wells were drilled and four new fields were discovered. Two

GEOPHYSICAL CREW doing seismic work in the Iray Purisima basin of Lower California. Last year, Pemex employed 45 exploration crews.

A PEMEX ENGINEER inspects a bridge being constructed to a wildcat discovery 25 miles from Veracruz.

of these are gas fields located in the northeastern part of the country. The other two are oil-producing fields located in the Poza Rica and Tabasco districts. So far this year, 34 exploratory wells have been drilled. The result of this year's drilling has been the discovery of four new producing fields—two in the Tampico district and two in the Tabasco-Isthmus area.

Of the above-mentioned discoveries, the most important have been made in the Tampico, Poza Rica and Isthmus-Tabasco districts. Among the newly discovered fields in the Tampico and Poza Rica areas are Tamaulipas-Constituciones, San Andrés, and Hallazgo, all producing from Jurassic formations which previously had not been developed in Mexico. It is important to mention that 18% of the country's production now comes from Jurassic sediments which were not producing oil 3 years ago.

In the Isthmus-Tabasco region, new field discoveries are among others La Venta, Ogarrio, Chilapilla, Agata and others which have contributed substantially to increase the Isthmus production to the highest level in the history of that area. This increase is partly due to the installation, in 1958, of the Ciudad Pemex absorption plant which recovers liquid hydrocarbons from rich gas fields such as Jose Colomo and Chilapilla.

The recent discoveries of Mecoacan, Tuplico and Santa Ana fields have established commercial oil production in a new province extending through North-Central Tabasco State.

Of equal importance is the production of absorption liquids from the gas produced in northeastern Mexico. In this area, the discovery of new fields and deeper producing sands within the last 5 years has doubled the reserves of this area.

The Present Reserves Picture

By the end of 1958, Mexico's proved oil and gas reserves were the largest in the country's history. The fact that a considerable portion of these reserves and of the present-day production comes from recent discoveries is sufficient to assure a steady rate of withdrawal equal to or even surpassing Mexico's domestic consumption.

The recent development of gas reserves which have been discovered within the last few years will permit the use of natural gas as a substitute for fuel oil. To this end, Petroleos Mexicanos has started to build a network of pipelines which will supply gas to industrial and population centers. The first step in this program is the 24-in. gas line from Ciudad Madero to Mexico City.

The task of meeting the continued increase in natural-gas consumption is amply assured by Mexico's proved gas reserves and by the future possibilities offered by the Reynosa (northeast) and Tabasco (southern) areas. Not content with this assurance, Pemex continues to increase its exploration activities—both geological and geophysical operations as well as wildcat drilling—in order to keep abreast of the increasing domestic demand for petroleum products.

New pool opened in southern Limestone

Travis Peak gas-condensate production has been opened 4 miles east of Thornton in southern Limestone County, East Texas, at Ralph Spence 1 Favors Estate. Calculated open-flow potential was 4,700 M.c.f.d. of gas. Condensate recovery was not estimated.

Pay is in the Travis Peak at 7,084-97 ft. Location is on a 136-acre tract in the Juan Luis Cahvert Survey. The well is 5 miles northwest of Rodessa and Pettet production at Southwest Oletha filed, and 4 miles northwest of Oletha field.

Heavy flow reported at salt-dome well

A development well at Bethel Salt dome in Anderson County, East Texas, has extended gas-condensate production to the southeast of the dome.

The new producer is Gragg Drilling Co. 1 O. L. Gragg, 3 miles southeast of the town of Bethel. On potential test, the well was rated at 37,500 M.c.f. of gas, plus 172 bbl. of 54° condensate per 1 M.M.c.f. Gas-liquid ratio was 5,800:1, and at the above rate, would exceed 6,000 bbl. a day.

Producing formation is the Rodessa, at 9,724-62 ft. Total depth was 9,816 ft. Shut-in pressure was 3,562 psi.

No. 1 Gragg is on a 220-acre tract in the A. M. Lewis Survey, A-481, in the Juan N. Acosta Grant. It is a southwest extension to W. D. McBee and Associates' 1 Adam Cone.

Green County adds new discovery

A NEW WILDCAT discovery is reported in Green County, Central Kentucky. Walter K. Howard completed 1 R. A. Thompson for 90 bbl. of oil per day, no water, after a 30-quart nitro shot. Location of the new pool-opener is in 7-H-47, in southern Green County, about 15 miles southwest of Greensburg and 3 miles east of Center, Ky.

Pay is the Corniferous Louisville of the Niagaran Middle Silurian at 554-562 ft. Total depth is 565 ft. It is located 1 mile from old production and is still making 50 bbl. per day 1 month after shot. It is the first quartz sand production in the area. All nearby pools, including Greensburg, have dolomite and limestone production. There are three offsets drilling. Gravity is 45°. Pool name is Howard. This is not an extension to Happy Valley field as previously reported. (O&GJ November 16, p. 319).

Field opened by Ohio discovery

In Ohio another pool opener in Vinton County is indicated by the results of Ohio Fuel Gas Co. wildcat on 1 Elbert Turner, Section 7, northwest Jackson Township.

The test found 437 M.c.f.d. natural production in the Clinton sand from 2,081-90 ft. with a rock pressure of 880 psi. The gage after fracture was 1,580 M.c.f.d.

Waverly Oil Works announced its 4 W. F. Mizer, Section 11, Fallsbury Township, Licking County, is flowing at the rate of 100 barrels oil per day.

This stepout in Fallsburg pool logged the Clinton sand at 3,040-88 ft. and had a good showing of oil natural with an estimated 300 M.c.f.d. of gas. No first 24-hour test was made after fracture.

Pennsylvania test drilling

In Pennsylvania's Warren County, a deep test well being drilled, the 1 Kapp is now stopped at 5,460 ft. in the Lockport dolomite, fishing for a lost string of tools. Drilling was delayed 3 weeks in November for cleaning and cementing. Biery-Johnson Co. expects to be in the Medina soon.

Texas' Sweeny extends production

First well drilled by Trice Production Co. in the relatively new Sweeny gas-condensate field, in southern Brazoria County, Texas Gulf Coast, extends production a half mile southeast. It is the field's fourth producer.

The new well, 1 MacDonald, has a calculated open-flow potential of 6,500 M.c.f.d. of gas, making 45 bbl. of 51.4°-gravity condensate per 1 M.M.c.f. Shut-in pressure is 4,169 psi. The field's Frio pay horizon is perforated at 11,682-94 ft. Total depth is 11,750 ft.

The Sweeny area is 1½ to 2 miles southeast of the expansive multiple-pay Ocean field. It was discovered in January 1958 by Pan American Petroleum Co., whose initial well flowed 34,500 M.c.f.d. of gas from perforations at 11,340-50 ft. Trice's well is on a 181-acre tract in the John Cummins Survey. It is 3 miles south of the town of Sweeny, now in Old Ocean field.

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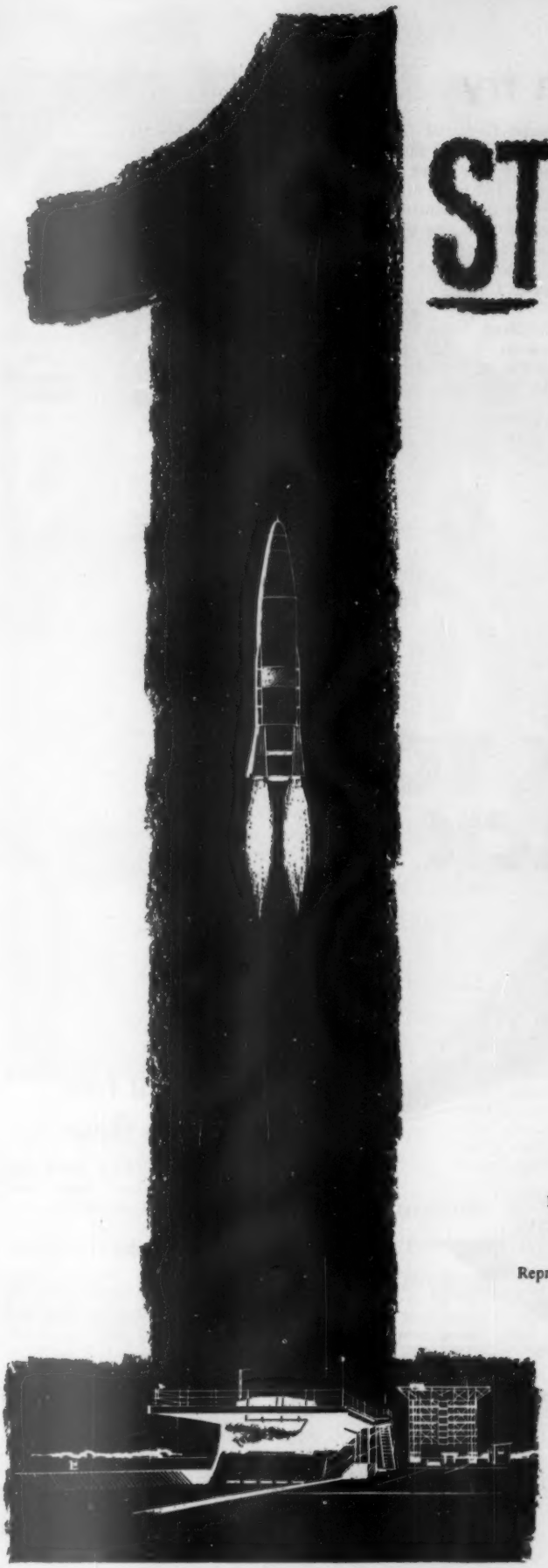

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THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

Drills set for far north try

THE BIT will be churning into the frozen tundra of the Northwest Territories at the 1 Grandview Hills wildcat by mid-December.

Since original plans for the drilling of this well were reported in late August many behind-the-scenes developments have taken place. Instead of Scurry-Rainbow Oil Co., Ltd.—a Canadian independent headquartered at Calgary—being drilling operator on this venture, Richfield Oil Corp. of California will take over. This project was reported as the first test ever within the Arctic Circle of Canada's northern reaches. The well site, about 18 miles west of the bank of the Mackenzie River, 150 miles northwest of Norman Wells oil-producing area, and 200 miles northeast of the now-famous Western Minerals 1 Chance oil and gas discovery well, is just within the Arctic Circle.

Four firms involved . . . Richfield, French Petroleum Co. of Canada, Hudson's Bay Oil & Gas Co., Ltd., and Clark Oil & Refining will split an 85% interest in the exploration project about equally. The remaining 15% working interest has not changed hands since the original plans were reported and Canadian Devonian Petroleums, Ltd., of Regina, Sask., will participate to that extent in the overall project.

The farmout arrangement which sees Richfield and partners assuming all drilling obligations on the Grandview Hills well also provided for a substantial cash payment to previous mineral-right owners, and an override royalty interest to the holding group. Scurry-Rainbow did not report cash received for its 67.5% stake but did state that it now has a 3% gross overriding royalty on the 3.5 million acres involved. Details on other's holdings, including those of Morrow Properties, Paddon Hughes Development, and Clearmonte Holdings have not been reported. Morrow previously held a 5% stake, Paddon Hughes 2.5% and Clearmonte 10%.

Increased outlook . . . It is reasonable to assume that the exploration project of the new group will be expanded considerably over that planned by the independent parties. It has not announced as yet but likely further geological studies to supplement the work of Scurry and its associates will be carried out shortly. The Scurry-Rainbow team has scheduled its test as a minimum 6,000-ft. venture. Drilling equipment owned and to be operated by Peter Bawden Drilling, Ltd., of Calgary is now within a few miles of the proposed well site (Lat. 67° 5′ N. and Long. 130° 58′ W.). Actual drilling operations were to have commenced by December 1 but the new deal has delayed spudding plans a few weeks.

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Alberta well has condensate flow

BIG GAS-CONDENSATE flows are reported at the Lookout Butte discovery well in southwestern Alberta's Pincher Creek area.

British American Oil Co., Ltd. reports a flow of 15,950 M.c.f.d. from perforations in the Mississippian at one interval, 12,900 M.c.f.d. from another set, and 7,230 M.c.f.d. from still another. Condensate flowed at the rate of 95 bbl. per million, 97.3 bbl. per million, and 107 bbl. per million, respectively. Mississippian was topped at 11,995 ft. The upper porous zone was at 12,139 ft.

(Continued on page 215)

HUNTINGTON ALLOY PRODUCTS PERFORM BETTER LONGER. Bottom-hole pump being lowered into well has barrel tube and all vital parts of corrosion-resisting Monel alloy to assure long pump life in well with high sulfur-content crude. Information about pump? Write Harbison-Fischer Manufacturing Co., Fort Worth Texas.

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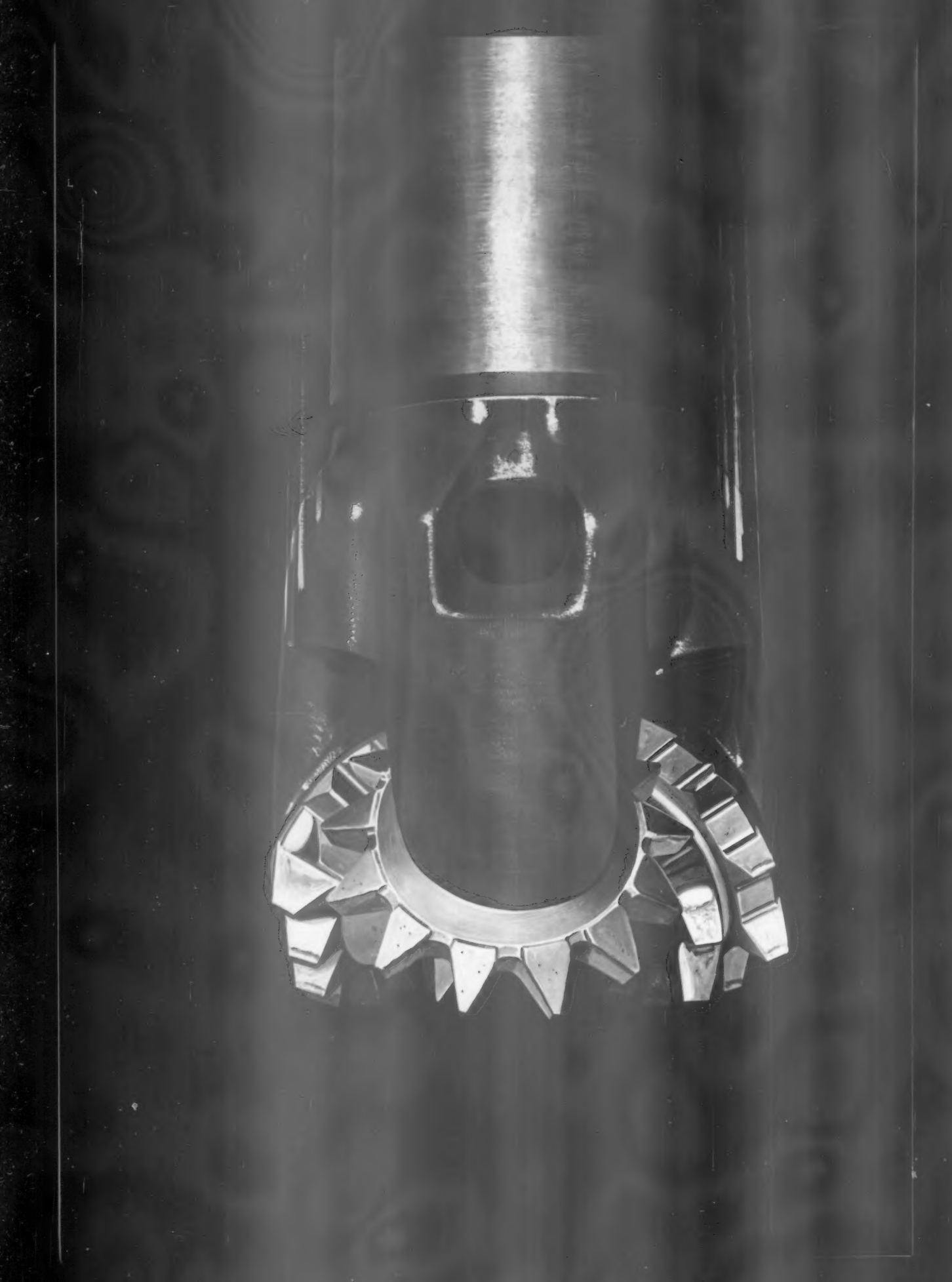

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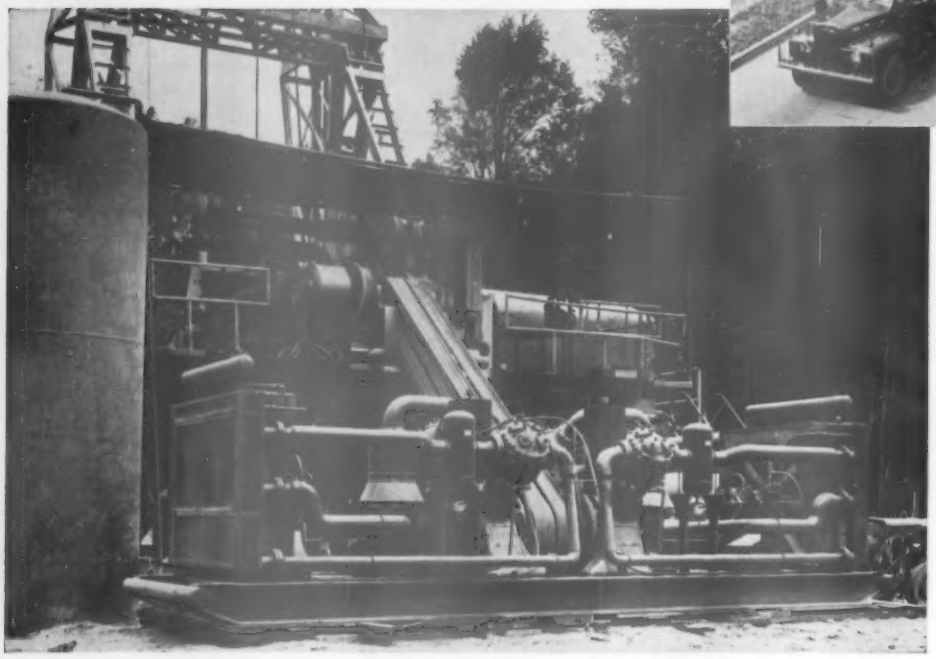

Joy AR-1 rig driven compressor operating in West Virginia after long haul over dirt roads.

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Air drilling operators can choose from three different self-driven or rig-driven models. Capacities from 50 to 6300 cfm; pressures from 52.5 to 500 psig. Find out more about Joy "package" compressors for fast air drilling plus fast over-the-road hauling. For additional information, write for bulletin 350-31.

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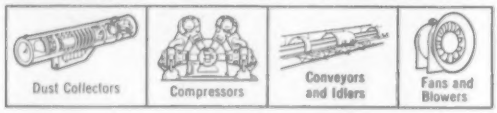


JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

(Continued from page 210)

This important discovery well is the 11-31-1-28 Lookout Butte on LSD 11, 31-1-28w4, 5½ miles north of the Montana border, and 6½ miles south of the Pincher Creek gas field.

Another Pincher Creek well . . . A recent big well inside Pincher Creek field itself will add to that giant's gas reserves. It is British American's 9-10 Pincher Creek. The well tested from Mississippian at the calculated open-flow rate of 201,110 M.c.f.d.

New Mexico field is extended

IN THE SAN JUAN BASIN Compass Exploration, Inc. of Denver has officially announced a natural initial potential of 2,400 bbl. of oil per day from its 1-1 Indian well, an extension to Horseshoe Canyon field in Northwest New Mexico.

One of the biggest producers in the area, the 1-1 Indian is located in 1-30n-16w, San Juan County, New Mexico. Production is from a sand development in the upper Gallup formation at 1,634 ft.

Operator had drilled to 1,622 ft. when the well blew out Monday night, November 16. After killing the well, operator drilled to 1,634 ft. The well was swabbed and kicked off and flowed through 5½-in. casing and 4-in. flow lines. In 6 hours 600 bbl. flowed into tanks before the new producer had to be shut in for lack of tank room.

South Dakota's Harding shows new activity

South Dakota's Williston basin activity includes widespread developments in Harding County's Buffalo field area.

Shell Oil Co. will run logs at its 12-17B Johnson. A drill-stem test at 8,448-73 ft. in Red River Ordovician recovered mud-cut water with a trace of oil. Total depth is 8,473 ft. This wildcat is 3 miles southeast of the 1 Tilus discovery that is in C SW NW 11-20n-4e, 8 miles southeast of Buffalo field.

Argo Oil and Carter Oil Co. quit the 1 State, 3 miles west of Buffalo field in SW NW 14-21n-3e. Swabbing Red River got fluid running from 5-10% oil.

North of the field, Shell spudded 14-4 State in SW SW 4-21n-4e. This is the northernmost spot in the field to date.

Shell is shut in at two apparent discoveries southeast and southwest of the above new location. The firm is moving in completion tools at a south outpost extension to Buffalo at 34-29 Johnson in SW SE 29-21n-4e. This well is 1 mile east of a recent extension completion in SW 28-21n-4e. Location is 2 miles south of the field proper.

Alberta reports two important discoveries

Two important natural gas strikes in Alberta are reported by Canadian Petrofina, Ltd. One is in the Wildcat Hills area, about 35 miles northwest of Calgary, and the other is in the Jenner area, about 100 miles southeast of Calgary.

Wildcat Hills wells, Imperial Wildcat Hills 6-35, and Western Imperial Wildcat Hills 10-3, are reported to have a combined potential of 27 M.M.c.f.d. of gas.

They were drilled by Imperial Oil Ltd., and Western Leaseholds, Ltd., with Western as the operator.

A third well is planned for Wildcat Hills. The gas in this field is under contract to Alberta and Southern Gas Co. Ltd., who propose to export it to markets in California. Alberta Gas Trunk Line Co., Ltd., recently applied to the Alberta Oil and Gas Conservation Board for the right to build a lateral pipeline into Wildcat Hills, which would tie the field into Trunk Line's proposed main foothills export pipeline.

Wildcat Hills was discovered about a year ago by Imperial Oil.

Petrofina also announced that the Jenner gas strike yielded 15 M.M.c.f.d. of gas. Jenner is in the vicinity of the Plains system of Alberta Gas Trunk Line, Ltd., which delivers the gas from this area to Trans-Canada Pipe Lines, Ltd., at the Alberta-Saskatchewan border.

Texas' Rio Grande gets gas-condensate strike

A rich gas-condensate discovery has been made by Northern Pump Co. in a wildcat 6 miles northeast of Weslaco, in southeastern Hidalgo County, in Texas' Rio Grande Valley. The new discovery, designated Northeast Weslaco, is west of the one-well Campacua field, discovered in 1955.

Northern Pump's well, 1 Joe Cook, is rated at 4,100 M.c.f. of gas daily, open flow. Its 54°-gravity distillate recovery is more than 40 bbl. per 1,000 M.c.f Completion is from perforated interval at 10,144-50 ft. The Campacua was completed in a 9,200-ft. sand.

Discovery wells

CALIFORNIA

Kern County: Kenneth H. Hunter, Jr., 1 Hunter-Brite, SW SE 16-31s-29e, 432 BOPD, 33.7° gravity, 4% cut, 18/64-in. choke, perfs. 8,264-8,444 ft., TD 8,449 ft. (Possible new fault-block discovery in Mountain View field).

Ventura County: Union Oil Co. of California 1 Union-Standard-Dryden Heirs, SE SE 12-3n-20w, 68 BOPD, 68.5% cut, 29.4° gravity, 16/64-in. choke, perfs. 3,506-4,971 ft., TD 7,737 ft. (Outpost ¼ mile south of Bardsdale field production).

WESTERN CANADA

Alberta: Fina-Canadian Superior 2-11-38-27 Red Deer, LSD 2, 11-38-27w4. D3 oil discovery. TD 7,350 ft.

Hudson's Bay et al. 6-33-39-10 Kessler, LSD 6, 33-39-10w4. Basal Quartz gas discovery. TD 3,064 ft.

Western et al. 10-36-25-1 Beddington, LSD 10, 36-25-1w5. Mississippian gas discovery. TD 7,575 ft.

Union 10-19-60-1 Westlock, LSD 10, 19-60-1w5. Viking sand gas discovery. TD 3,475 ft. Saskatchewan: Champlin 9-31-1-32 Elmore, LSD 9, 31-1-32w1. Midale oil discovery. TD 4,110 ft.

Great Plains 11-11-40-14 Halkirk, LSD 11, 11-40-14w4. Basal Quartz oil well. TD 3,515 ft.

Kerr-McKee 6-18-22-8 Halsbury, LSD 6, 18-22-8w4. Glauconitic gas discovery. TD 3,249 ft.

MISSISSIPPI

Hinds County: Jett Drilling Co., Inc., 1 Gaddis Farms, 14-6n-3w. IP 206.25 BOPD, 14/64-in., 42°, TP 375 psi., perf. 10,722-34 ft., first Rodessa sand. TD 12,506 ft. Extends Bolton field.

NORTH LOUISIANA

Catahoula Parish: Olin Oil & Gas Corp. and Elisha Walker, Jr., 1 Olin-Tensas Delta, 1-5n-5e, 1¾ miles northwest of Larto Lake field. IP 60 BOPDm 7/64-in., 40.5°, GOR 200 cu. ft. per bbl., TP 430 psi., perf. 5,422-26 ft., Wilcox. TD 5,819 ft. Discovery well of Long Branch field.

LaSalle Parish: Hunt Oil Co. 137-H Louisiana Delta Hardwood, 33-5n-42, 3 miles west of Saline Lake field. IPP 33 BOPD, perf. 5,310-14 ft., Wilcox. TD 6,000 ft. Discovery well West Saline Lake field.

Red River Parish: Jones-O'Brien, Inc., 1 Fossett, NW NE NE 22-14n-11w, 2½ miles east of Gay Island field. Open-flow potential (calculated) 1,650 M.c.f.d., shut-in TP 718 psi., perf. 1,712-15 ft., Buck sand. TD 3,006 ft. Discovery well Williams field.

Tensas Parish: Jett Drilling Co., Inc., and Sun Oil Co. 2-A Fisher, C SE NW 11-12n-10e, 4 miles northeast of Justina. IP 81 BOPD, 12/64-in., 38°, GOR 600 cu. ft. per bbl., TP 600 psi., perf. 8,133-46 ft., Lower Tuscaloosa. TD 8,222 ft. Extends Lake Marydale field.

SOUTH LOUISIANA

Acadia Parish: American Natural Gas Producing Co. 1 Leger, 22-10s-1e. IP 91 BOPD, 6/64-in., 32.2°, GOR 500 cu. ft. per bbl., TP 775 psi., perf. 5,603-07 ft. TD 7,520 ft. New pay in South Crowley field.

Lafourche Parish: The California Co. 65 Louisiana Delta Farms, 11-17s-22e. IP 47 BOLD, adjustable chokes, 42°, GOR 14.36 M.c.f. per bbl., TP 930 psi., perf.

(Continued on page 227)

Refining Offers Big Challenge

. . . of converting entire barrel of oil to high valued products, new AIChE president Jerry McAfee declares.

DR. JERRY McAFEE, Gulf Oil Corp.'s vice president for manufacturing, has another honor and job. He's the 1960 president of the American Institute of Chemical Engineers.

Result of the mail ballot among the institute's more than 18,000 members was announced at the fifty-second annual AIChE meeting in San Francisco.

McAfee has just completed a term as vice president of the institute and has been active in its affairs for years.

The authority on catalytic processing also is active in work of the American Chemical Society, American Petroleum Institute, and World Petroleum Congress. Last June he was honored by the University of Texas as a distinguished contemporary engineering graduate.

Dr. Jerry McAfee
. . . second-generation expert.

Born to refining . . . McAfee is a second generation refinery expert for Gulf.

His father is A. M. McAfee, now retired, who is considered the father of commercial catalytic processing. The McAfee process using aluminum chloride to crack gas-oil is credited by many authorities with being the first commercial catalytic-cracking process.

The elder McAfee's work also extended to a new low-cost method for synthesizing aluminum chloride from bauxite and chlorine and further application of the Alchlor process to the refining of lubricating oils. The latter process is currently in use by Gulf.

Jerry was born in Port Arthur, Tex., where his father worked at the big Gulf refinery. He received his early education there and later at the University of Texas, receiving a B.S. degree in chemical engineering in 1937. He did graduate work at Massachusetts Institute of Technology, taking a doctorate in chemical engineering in 1940.

McAfee's summers during college were spent working at Gulf's Port Arthur refinery. Typically, his first job was in the laboratory doing very basic work: Rolling drums of sample oil out back of the experimental building and putting them up on blocks.

McAfee joined Universal Oil Products Co. in Chicago after leaving MIT and worked in various parts of the country for the firm until 1945. From 1945 to 1950, he was back home, serving as a technical specialist at Gulf's Port Arthur refinery.

From then, McAfee's advancement was rapid. In 1950 he was named director of the chemistry division at Gulf's Hamarville, Pa., research center. He became assistant director of research in 1951, vice president and an associate director of Gulf Research & Development Co. in 1954, a vice president of Gulf manufacturing in 1955.

In addition McAfee has executive positions with Venezuela Gulf Refining, Gulf Research & Development, Goodrich-Gulf Chemicals, Neches Butane Products, and Callery Chemicals.

What's ahead . . . McAfee feels that refiners still have a long way to go in processing development.

He says there is one big challenge before petroleum scientists: Devise ways to make more valuable products at reduced costs.

The day is coming, McAfee believes, when refiners will convert the entire barrel of crude to high valued, mobile fuels. The nation then will cease to burn petroleum in the form of residual fuel oil.

Other officers . . . New vice president of AIChE for 1960 will be John J. Healy, Jr., a member of the corporate planning group of Monsanto Chemical Co., St. Louis.

Dr. J. Henry Rushton, Purdue University, Lafayette, Ind., was reelected treasurer, and Frank J. Van Antwerpen of Nutley, N. J., was reelected secretary.

Directors named were: Donald A. Dahlstrom, director of research and development, Eimco Corp., Palatine, Ill.; Dr. Charles R. Wilke, chairman of the chemical engineering department, University of California, Berkeley; Karl H. Hachmuth, engineering advisor to the vice president of research and development, Phillips Petroleum Co., Bartlesville, Okla.; and W. K. Menke, vice president, chemical division, Pittsburgh Coke & Chemical Co.

▶▶▶ Personals

C. F. Montgomery has been named executive vice president in the Houston headquarters office of Wanda Petroleum Co.

W. P. Dockery, formerly with Great Plains Development Co. of Canada, Ltd., in Calgary, has joined Harry Bass Oil Co. as production manager for Canadian operations. Dockery was with Imperial Oil Ltd. before joining Great Plains in 1957.

James C. Gilbert, manager of appraisals and economics for Husky Oil Co., has been appointed manager of land and exploration. Gilbert joined Husky in 1943.

F. E. Frey, an associate director of research for Phillips Petroleum Co., and **A. Clark,** manager of the research division's catalytic processes branch, have been named senior scientists, a new post. **D. E. Carr,** an assistant director of research, has been named deputy director. **W. W. Crouch, J. E. Mahan,** and **D. C. Smith** have been promoted to assistant directors. Crouch was formerly manager of the synthetic rubber branch, research division. Mahan was manager of chemicals and rockets branch, and Smith supervised a new nuclear physics section.

Robert M. Youngs has been elected president of Louisiana Land & Exploration Co. He succeeds **Jack O. McCall,** who has resigned. Youngs will continue as chairman of the company.

▶▶▶ Personals

M. W. Johnson, deputy coordinator of marketing for Standard Oil Co. (N. J.), has been appointed coordinator of worldwide marketing activities. He succeeds **D. W. Ramsey,** who recently was named vice president and a director of the new Humble Oil & Refining Co. **G. W. Butler,** assistant general manager of marketing for Esso Standard Oil Co., will succeed Johnson. **Alex A. Diffey,** operations manager in Esso Standard's marketing department, New York City, has succeeded Butler with Esso. Johnson had been with Jersey's foreign subsidiaries, Esso Standard Oil, S.A., and Esso Standard do Brasil, Inc., before becoming deputy coordinator of marketing for the parent company last year. He was president and a director of Esso do Brasil. Butler has been with Esso since 1929; Diffey joined Esso in 1932.

JOHNSON

Gerald G. Loucks, district exploration geologist in Canada for Kerr-McGee Oil Industries, Inc., has been transferred to the southern Rocky Mountain region office in Denver. **Joe Hull,** staff geologist in Oklahoma City, has been transferred to the Canadian division office in Calgary. Also, **Harold Thurman,** geologist, has been transferred to New Orleans from Oklahoma City. **Jon Palmer,** junior geologist in Denver, has been transferred to Oklahoma City.

Auby Rowe, Jr., McAlester Fuel Co., Billings, Mont., has been elected chairman of Montana Petroleum Association. He succeeds **H. G. Carmichael,** Butte. Other officers will include **O'Neal Callahan,** Carter Oil Co., vice chairman; **P. A. Thomson,** Farmers Union Central Exchange, treasurer; and **James B. Patten,** executive secretary. New executive board members are **George Washington,** Northern Pacific Oil Development Co., and **Marshall Huntsberry,** Flint Rig Co.

M. H. Doherty, Texaco Exploration Co., has been named president of the Western Canada Oil Scouts Association. He succeeds **K. M. Simpson,** British American Oil Co., Ltd., who continues as an advisor. **G. I. Sampson,** Phillips Petroleum Co., has been named vice president of the group. **J. W. Heap,** Canadian Superior Oil of California, Ltd., is secretary, and **F. M. Dwyer,** Canada Cities Service Petroleum Corp., treasurer.

R. I. Clark, tool pusher with Helmerich & Payne, Inc., has been transferred to Duncan, Okla., from Davis, Okla.

Dr. Charles M. Starks has joined Continental Oil Co.'s research and development department in Ponca City, Okla., as research chemist.

G. E. Allen, field operating supervisor for Mobil Oil Co.'s South Dakota and Fargo, N.D., districts, will retire January 1 after 36 years with the company.

Sidney S. Galpin, central division production engineer for New York State Natural Gas Corp., has been appointed southern division superintendent. He will headquarter in Jeannette, Pa.

James S. Peterson, senior computer in Sinclair Oil & Gas Co.'s geological department, Lafayette, La., has been promoted to senior geophysicist. **Horace C. Spence, Jr.,** senior computer in the New Orleans geological department, has been named senior geophysicist there.

F. J. Keleher, treasurer of Pan American Petroleum Corp., has retired after 42 years with Pan Am and its predecessor companies. At the time of Pan Am's formation, Keleher had been principal financial officer of all three companies combined to form the producing subsidiary of Standard Oil Co. (Ind.).

Marvin W. Rigdon, special drilling superintendent for Sunray Mid-Continent Oil Co., has retired after 35 years with the company and its predecessors. Rigdon was a drilling superintendent for the old Mid-Continent Petroleum Corp. in Oklahoma's Seminole field during its boom. He was later Oklahoma City district production superintendent, Seminole district superintendent, and superintendent of operations in Mid-Continent's Tulsa offices.

T. W. Barron, superintendent of Shell Oil Co.'s Notrees, Tex., TXL gasoline plant, has been appointed manager of the Wasson plants, Denver City, Tex. **W. L. Covington,** operations foreman of the TXL plant, more recently on special assignment, will succeed Barron. **W. J. McKeel,** acting operations foreman, will succeed Covington at TXL. **W. M. Koch,** gas engineer in the Wasson plants, has been promoted to assistant plant superintendent there. **J. V. Reed** will replace McKeel as shift foreman at the TXL plant.

Jerry Meldahl, geologist with Carter Oil Co., has been transferred to Casper, Wyo., from Miles City, Mont.

Clayton Walker, petroleum engineer with Lawson Petroleum Co. in Nowata, Okla., has joined Graybol Oil Corp. in Tulsa as petroleum engineer.

H. A. Fitzgerald, process foreman for Hydrocarbon Research, Inc., in Athens, Greece, has joined Midland Cooperatives, Inc., as process supervisor at the Cushing, Okla. refinery.

CHRISTENSEN

MERLISS

BENTLEY

R. J. Christensen, formerly district engineer for Oil Recovery Corp., has been named manager of production and engineering in the company's Tulsa office. **Frederick E. Merliss,** former manager of production and exploration research with Cities Service Research & Development Co., has joined Oil Recovery as manager of research and development. He will headquarter in Tulsa. **Lee Bentley** has been named manager of the commercial department, also in Tulsa. **H. J. Ramsay, Jr.,** petroleum engineer with Mobil Oil Co. in Andrews, Tex., has joined Oil Recovery's Tulsa office as evaluation engineer.

Stanley Carper, Carper Drilling Co., Artesia, N. M., has been elected president of New Mexico Oil and Gas Association. **T. H. Hammett,** Sinclair Oil Co., Denver, has been named vice president; and **Paul Rutledge,** Rutledge Drilling Co., Santa Fe, has been reelected treasurer. Executive committee members include **W. K. Shelshear,** Gulf Oil Corp., Roswell; **Fred Smith,** Sunray Mid-Continent Oil Co., Midland, Tex.; **Robert L. Moran,** Moran Drilling Co., Hobbs; **Harvey Yates,** Yates Brothers Co., Artesia; **John M. Kelley,** Roswell independent; and **W. B. Macey,** Western Development Co., Artesia.

▶▶▶ Personals

Mark E. Houser, director of manufacturing for Wilshire Oil Co. of California, has been elected vice president for manufacturing. Houser, manager of the company's Norwalk, Calif., refinery, has responsibility for the pipeline department and is coordinator of economic research. A graduate of the University of Minnesota, Houser has been in the oil industry since 1943.

Mark Guinan, formerly in Richfield Oil Co.'s Durango, Colo., office, has been transferred to Casper, Wyo., as district geologist. He succeeds **John Weise,** who has been named research geologist in Anaheim, Calif. **Stan Conrad** has been appointed district geologist in Salt Lake City.

B. Oliver Wood, consulting petroleum engineer, and **Joe B. McShane, Jr.,** formerly petroleum engineer and water flood project superintendent for Signal Oil & Gas Co., have formed Wood & McShane, petroleum consulting firm in Monahans, Tex. The company will specialize in secondary recovery projects.

John H. Nation, manager of production for Cooperative Refinery Association, Great Bend, Kans., has been named "Oil Man of the Year" by the Great Bend Petroleum club. **Donald D. Vaughn,** Triangle Drilling Co., received the "Oil Man of the Future" award.

Charles Doak Lowry, Jr., and **Seaton T. Preston, Jr.,** have formed a new abstracting service, Instrumentation Abstracts. Lowry and Preston have offered Gas Chromatography Abstracting Service for the past year. The new abstract service will cover American and foreign journal articles, papers presented at technical meeting, patents, and books.

George R. Brown, staff petroleum engineer in the New York domestic producing department of Texaco Inc., has been appointed assistant manager of Texaco Exploration Co., a subsidiary. He will headquarter in Calgary. Brown succeeds **Roy Whisenhunt,** who has been named Midland, Tex., division assistant manager in the parent company's domestic producing department.

J. T. Robichaux, assistant manager of American Oil Co.'s terminal department, has been appointed general superintendent of plants, New York region. He succeeds the late K. A. Beede.

Dr. Francis P. Baldwin, section head for Esso Research & Engineering Co. in Linden, N. H., has been named a research associate in the chemicals research division. He will head a project team in exploratory elastomer research.

Ed Dahlke, John Skvarla, and **Ronald Stang,** engineers in the technical department, economics and design division, at Esso Standard Oil Co.'s Bayway refinery, Bayonne, N. J., have been promoted to senior engineers.

Max P. Watson, manager of gas purchases in the gas supply department of United Gas Pipe Line Co., has been named assistant to **Ed Parkes,** president of United Gas Corp. and its subsidiaries, Union Producing Co. and United Gas Pipe Line Co.

Ted B. Lacaff, Jr., formerly with Argo Oil Co. in Midland, Tex., has joined Texas American Oil Co. as general superintendent in charge of drilling and production operations. Lacaff was with Core Laboratories, Inc., and Gulf Oil Corp. before joining Argo.

W. M. V. Ash, president of Shell Oil Co. of Canada, Ltd., has been appointed council vice chairman of the Duke of Edinburgh's second Commonwealth Study Conference. The meeting will be held in Canada in 1962. A previous conference was held in Oxford in 1956.

Carl E. Shirron, terminal foreman for Texas Eastern Transmission Corp. at Baytown, Tex., has been named foreman of the newly acquired Texas Eastern terminal at Helena, Ark. **Lloyd Clinton Roberts,** assistant terminal foreman at Beaumont, Tex., will replace Shirron as Baytown foreman. **George Albert Neuser, Jr.,** control point operator at Beaumont, will succeed Roberts.

A. E. Chester, manager of producing for Mobil Oil Co.'s Dallas division, will retire January 1 after 40 years with Socony Mobil Oil Co. affiliates. Chester was vice president, manager of the producing division, and a director of Magnolia Petroleum Co. before the recent Mobil-Magnolia merger.

J. Glenn Cole, formerly with Amerada Petroleum Corp. in Casper, Wyo,. has joined Apache Oil Corp. in Denver as staff geologist.

L. B. Simpson, pipeline district superintendent in Danville, Ill., for Trunkline Gas Co., has been transferred to Villa Grove, Ill., in the same capacity.

Dr. E. G. Lindstrom has been appointed senior research chemist in the petroleum products research division of California Research Corp.'s Richmond, Calif., laboratory. **Donald L. Beers** has joined Cal Research at Richmond as research engineer, engine lubricating oil division.

KYSER

John L. Kyser, assistant manager of Phillips Petroleum Co.'s supply and transportation department, has moved up to manager of the department. He succeeds **Harry G. Fair,** who was elected vice president, supply and transportation, earlier this year. Kyser joined Phillips in 1937. He has been in the supply and transportation department since 1944. He is a graduate of Kansas State University.

Kenneth A. Stierman, assistant superintendent of the Fostoria, Ohio, products pipeline division of Standard Oil Co. (Ohio), has been given a 2-year leave of absence to serve as senior pipeline engineer for Iranian Oil Refining Co. Iranian Oil Refining is an operating company of the Iranian consortium, in which Ohio Standard has an interest.

Pat H. Cain has joined Texas Gas Corp. as reserves engineer. **William C. Cooley, Jr.,** has joined the company as geologist. Cain has been with Standard Oil Co. of Texas, Tennessee Gas Transmission Co., H. Zinder & Associates, and International Petroleum (Colombia), Ltd. Cooley was with Gulf Oil Corp. before joining Texas Gas.

Robert F. Bryant, Jr., formerly staff land man for the old Magnolia Petroleum Co. in Dallas, has opened consulting offices there. He will specialize in unitization and lease purchases. Bryant moved to Dallas in 1948 in charge of field-wide unitization for Magnolia. He has been chairman of land committees for 47 field-wide unitizations, including Sacroc, Pegasus, and other large units.

Donovan C. Wise, southern division superintendent for New York State Natural Gas Corp., has been named manager of operating plans and budget. He will headquarter in New York.

J. B. Lawson, a vice president of Great Lakes Pipe Line Co., has retired. Lawson joined the company during construction of the system in 1930. He was general superintendent before being named a vice president in 1949.

G. M. Boyer, assistant division marketing manager on special assignment for Continental Oil Co. in Houston, has been named assistant to the vice president in charge of foreign crude and products distribution department, a new position. He will headquarter in New York.

S. Douglas Turner, formerly Alberta division manager for the Canadian Petroleum Association, has been appointed general manager of the new Big Inch Pipe Corp., Ltd. He will be in charge of operations at the company's large-diameter pipe mill in Calgary.

George J. Blundun, chief geophysicist for Home Oil Co., Ltd., has been named exploration manager. **Eugene T. Cook** has been appointed head of the geophysical department. Blundun had been with Gulf Oil Corp. and Northwest Seismic Surveys, Ltd., before joining Home Oil.

Henry H. Neel, manager of Tidewater Oil Co.'s foreign exploration and production department, has been named general manager of a new operating division. The division will direct Tidewater's exploration and production in all foreign countries with the exception of the Iranian consortium in Iran and operations in Saskatchewan, Canada. **Robert Dyk,** formerly chief geophysicist for Tidewater, will be exploration manager for the new division. **John P. McCabe,** assistant to the production manager in Los Angeles, will be division production manager. Tidewater has interests in Turkey, Pakistan, Guatemala, and Canada and has submitted bids for acreage in Spain and in the Spanish Sahara. **Murray E. Body** is regional manager of operations in Turkey. **Martin H. Mitchell** is regional manager for Pakistan.

NEEL

DYK

McCABE

▶ ▶ ▶ Personals

L. W. Martin, formerly assistant Omaha division manager for Skelly Oil Co., has been transferred to Aberdeen, S. D., as division manager.

T. C. Bergstrom, Barney R. Treadway, and **Donald P. Squier** have joined California Research Corp.'s La Habra, Calif., laboratory as research engineers.

Robert R. Park, engineer with Texas Eastern Transmission Corp., has been transferred from Shreveport, La., to the Houston coordinating and planning department.

Milton Wivchar, formerly process engineer with Arthur G. McKee & Co. in Cleveland, has joined Tidewater Oil Co. in Delaware City, Del., as economic analyst.

Homer Z. Martin, special assistant in the office of the coordinator of fuels processes for Esso Research & Engineering Co., has been appointed coordinator of petroleum process research.

Robert M. Shepardson, manager of the marketing-development division, marketing - coordination department, for Standard Oil Co. (N. J.), has been elected a vice president of Esso Export Corp. He will also be general manager of Esso Export's new lubricants and specialties department.

▶ ▶ ▶ Deaths

William G. Heltzel, internationally known pipeline consulting engineer, died December 3 in a Tulsa hospital. Heltzel did engineering work for the crude-oil line connecting Algeria's Hassi Messaoud field with the Mediterranean. The line was completed in August. He also had worked on projects in Brazil, Chile, and other countries since entering the consulting field in 1946. Before that he had been vice president and general manager of Stanolind Pipe Line Co., now Service Pipe Line. He was for several years chairman of the Petroleum Division of ASME and was widely recognized for his work in hydraulics engineering.

T. Orchard Lisle, 73, publisher emeritus of International Oilman magazine, died December 1 in Fort Worth after a long illness. Lisle was one of the founders of World Petroleum magazine. He was executive editor and general manager of the Petroleum Times, London, from 1935 through 1940. In 1946 he founded Oil Forum, now International Oilman, in New York. The magazine was moved to Fort Worth in 1950.

Robert E. Brooks, 38, division staff engineer for Sunray Mid-Continent Oil Co., died November 23 in Midland, Tex. A graduate of the University of Oklahoma, Brooks joined Sunray in 1956. He had been transferred to Midland from Tulsa earlier this year as part of a company decentralization program.

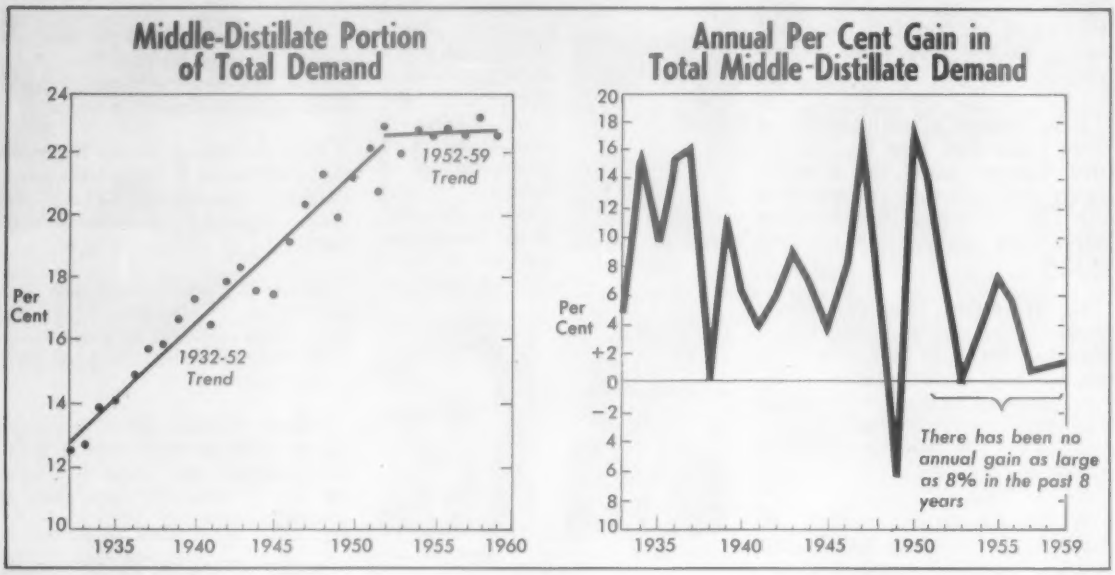
Carl K. Mount, Sr., 49, Houston independent operator, died November 22 in a Houston hospital. Mount was a graduate of the University of Texas.

Henry Lee Kirk, 68, retired operations foreman of Anderson-Prichard Oil Corp.'s Arkansas City, Kans., refinery, died November 28 in an Arkansas City hospital. Kirk retired in 1956. Before joining Anderson-Prichard he had been with the old Indian Refining Co., White Eagle Oil Co., and Gulf Oil Corp.

James Joseph Molloy, 58, field engineer for Sinclair Refining Co., died November 29 in a Tulsa hospital of cancer. Molloy had been with Sinclair and its predecessor, Prairie Oil & Gas Co., for 32 years.

Gordon Taylor, 63, field engineer for Pacific Western Oil Co. in the Taft, Calif., area, died November 21 in Los Angeles after a long illness.

Steve P. Hannifin, district landman for Mobil Oil Co., died November 19 in a Roswell, N. M., hospital after a heart attack. Hannifin had been with Magnolia Petroleum Co., now Mobil Oil, in Roswell since 1928.


Middle-Distillate Portion of Total Demand
Per Cent
1952-59 Trend
1932-52 Trend
Annual Per Cent Gain in Total Middle-Distillate Demand
Per Cent
There has been no annual gain as large as 8% in the past 8 years

Distillate no longer leads the parade

BY JOHN C. CASPER

REFINERS' PLANS for the next 5 years should not be based on continuing gain rates in line with records for the past 15 years. The charts on this page show why.

For the 20-year period ended about 1952, demand for middle distillate was expanding much faster than demand for other products. In that period total demand for kerosine and distillate fuels gained about 8.9% a year. Other products gained 5.0% a year.

Since the year 1952, percentage increases in distillate demand have been about in line with gains by other petroleum products.

These trends can be demonstrated by another series, shown in graphic form in the left chart at the top of the page. The plotted points on the graph represent middle distillate's portion of total oil demand each year since 1932. Figures for 1959 are estimated. Each year's portion is expressed as a per cent of total demand.

Note that there is a break in the series somewhere around the year 1952. The points show a sharp upward trend for the period 1932-52. From 1952 until the present, the trend is almost flat.

In the year 1932, demand for kerosine and distillate fuel accounted for 12.59% of total oil demand. By 1952, the kerosine-distillate portion of total demand had risen to 22.87%.

The story has been quite different since 1952. Demand for kerosine and distillate this year will account for about 22.50% of total petroleum demand, down a little from the 22.87% in 1952.

When the points follow a horizontal trend, middle distillate and all oils are gaining at about the same rate. This has been the story since 1952. But, other available data indicate that demand for heating distillates may not grow as fast as other-product demand in the coming years.

Distillate and gas replaced coal as home-heating fuels from about 1935 to 1950. There has been some replacement in recent years, but most of it has been by gas.

In 1935 kerosine and distillate fuel accounted for 7.2% of all fuels consumed for residential purposes and commercial heating (OGJ, July 27, 1959, p. 144).

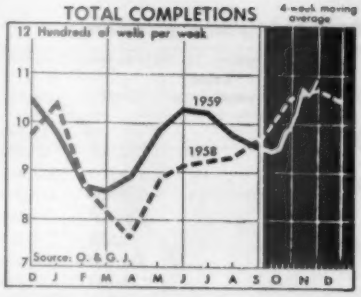
By 1950 middle distillate was up to 20.9% of the total for a net gain of 13.7 percentage points. For the same period, total gas sales to the same type of customers gained about the same or 13.3 percentage points. Gas includes natural, manufactured, and LPG.

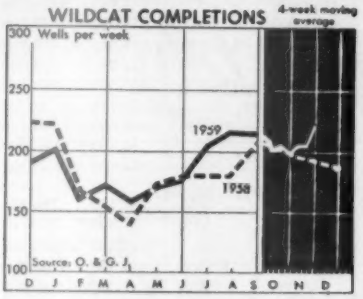
The story has been different since 1950. For the period 1950-57, kerosine and distillate sales moved up 6.7 percentage points, but gas jumped 15.1 points.

If this trend continues, distillate will not be able to maintain its present position in the oil-demand total. The end result could be further slowing in the growth of oil demand.

A quick look at the highlights

	LATEST WEEK	Change from YEAR AGO		Change from YEAR AGO	
Production	6,979,210	UP	21,950	DOWN	23,340
Crude stocks	252,473,000	DOWN	1,475,000	DOWN	5,825,000
Completions	1,154	UP	173	UP	85
Refinery runs	7,973,000	DOWN	44,000	DOWN	188,000
Gasoline stocks	179,179,000	UP	1,919,000	UP	5,579,000
Kerosine stocks	31,692,000	DOWN	278,000	DOWN	240,000
Distillate stocks	170,886,000	DOWN	3,695,000	UP	9,447,000
Residual stocks	56,189,000	DOWN	103,000	DOWN	10,010,000
Four-product stocks	437,946,000	DOWN	2,157,000	UP	4,776,000
Total imports	1,794,000	UP	211,400	UP	294,500





Active Rotary Rigs

	11-30-59	11-23-59	12-1-58
Alabama	6	6	12
Arkansas	15	14	28
Arizona	0	0	1
California	95	104	88
Land	90	97	(*)
Offshore	5	7	(*)
Colorado	53	59	28
Florida	1	1	1
Land	1	1	1
Offshore	0	0	0
Illinois	42	42	57
Indiana	7	10	8
Iowa	0	0	3
Kansas	157	159	141
Kentucky	8	11	8
Louisiana	330	321	337
North	46	46	44
S. Inland waters	127	114	151
S. Land	102	106	100
Offshore	55	55	42
Maryland	0	0	1
Michigan	23	36	14
Mississippi	81	75	54
Missouri	1	1	2
Montana	21	22	26
Nebraska	27	24	17
Nevada	0	1	0
New Mexico	128	126	111
New York	0	0	1
North Dakota	28	26	32
Ohio	0	0	5
Oklahoma	253	248	247
Oregon	0	0	0
Pennsylvania	13	11	10
South Dakota	5	6	0
Texas	800	778	822
S. Inland waters	5	6	8
S. Land	192	185	153
Offshore	2	3	0
North-East	200	200	188
West Central	255	238	296
West	146	146	177
Utah	34	30	40
Washington	1	1	1
West Virginia	4	5	2
Wyoming	80	89	82
Total U. S.	2,213	2,206	2,179
Western Canada	193	171	176
Eastern Canada	1	1	0
Grand total	2,407	2,378	2,355

Hughes Tool Co. report. *Comparisons not available due to change in method of reporting.

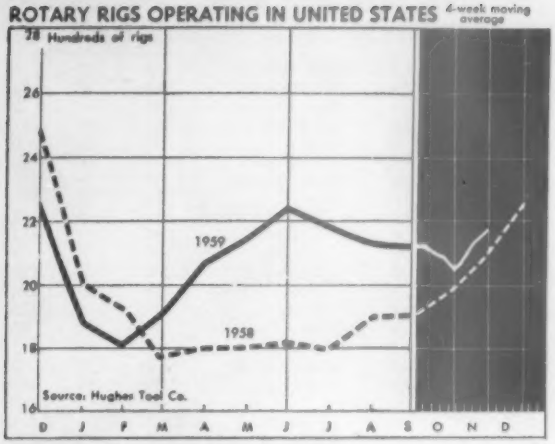
WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 28, 1959

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	1	1	0	0	0	0	11,505	84	70	0	0	0	0	0	21	26
Arizona	0	0	0	0	0	0	0	25	.....	0	0	0	0	0	23	.....
Arkansas	15	5	0	3	7	0	63,112	761	736	4	1	0	2	1	135	148
California	22	9	0	3	10	0	101,139	1,397	1,377	4	0	0	0	4	365	339
Colorado	17	5	0	1	11	0	88,015	702	777	14	3	0	1	10	401	450
Illinois	50	24	0	0	26	0	117,395	2,141	2,182	6	1	0	0	5	361	422
Indiana	14	5	0	1	8	0	19,094	785	792	2	1	0	0	1	265	288
Kansas	68	32	0	3	33	0	238,457	3,617	3,686	20	3	0	1	16	963	772
Kentucky	129	109	0	0	20	0	88,852	2,796	1,713	12	0	0	0	12	335	162
Louisiana	78	46	6	4	22	0	577,663	3,444	3,178	4	0	0	0	4	463	467
North	35	20	0	3	12	0	124,278	1,368	1,245	3	0	0	0	3	209	209
South	29	16	5	1	7	0	312,853	1,702	1,548	1	0	0	0	1	239	234
Offshore	14	10	1	0	3	0	140,532	374	385	0	0	0	0	0	15	24
Michigan	12	5	0	1	6	0	45,683	600	400	4	0	0	0	4	166	132
Mississippi	7	3	0	0	4	0	69,892	581	365	4	1	0	0	3	256	159
Montana	2	1	0	0	1	0	8,062	313	299	1	0	0	0	1	109	119
Nebraska	17	4	0	0	13	0	98,916	819	675	8	0	0	0	8	356	320
New Mexico	44	24	2	3	15	0	215,046	1,913	1,792	6	0	0	0	6	224	245
West	12	2	1	3	6	0	43,827	847	881	1	0	0	0	1	60	94
East	32	22	1	0	9	0	171,219	1,066	911	5	0	0	0	5	164	151
New York	0	0	0	0	0	0	0	237	487	0	0	0	0	0	19	41
North Dakota	10	3	2	0	5	0	62,210	402	419	4	0	0	0	4	74	129
Ohio	22	7	0	6	8	1	62,551	993	948	1	0	0	0	1	30	17
Oklahoma	*235	131	4	8	91	1	987,568	5,045	5,764	44	5	2	4	33	779	789
Pennsylvania	0	0	0	0	0	0	0	523	528	0	0	0	0	0	19	19
South Dakota	1	0	0	0	1	0	8,473	20	.....	1	0	0	0	1	9	.....
Texas	366	170	19	20	149	8	1,525,573	17,033	16,494	75	0	0	0	75	3,209	3,325
District 1	27	13	2	0	12	0	77,822	993	893	6	0	0	0	6	302	345
District 2	15	5	3	3	4	0	95,837	735	680	2	0	0	0	2	213	180
District 3	32	5	8	0	19	0	236,649	1,088	1,168	6	0	0	0	6	215	265
District 4	28	4	3	4	17	0	144,185	1,227	1,051	5	0	0	0	5	305	314
East	19	9	0	1	9	0	109,612	1,149	1,114	6	0	0	0	6	224	301
District 7-B	60	31	0	2	26	1	136,471	2,382	2,300	13	0	0	0	13	629	634
West	101	70	2	2	24	3	480,982	5,105	4,715	12	0	0	0	12	692	641
District 9	67	28	1	1	34	3	166,682	3,185	3,353	21	0	0	0	21	529	529
District 10	17	5	0	7	4	1	77,333	1,169	1,220	4	0	0	0	4	100	116
Utah	10	2	0	0	8	0	59,494	284	359	8	0	0	0	8	86	77
West Virginia	16	1	0	10	5	0	39,891	710	705	0	0	0	0	0	27	18
Wyoming	17	5	0	2	10	0	73,622	878	684	8	0	0	0	8	320	233
Misc. (Alaska)	1	0	0	0	1	0	8,865	84	87	1	0	0	0	1	57	77
Total U. S.	**1,154**	592	33	65	454	10	4,571,078	46,187	44,517	**231**	15	2	8	206	9,072	8,774
Prev. week	981	512	22	70	360	17	3,655,937	.....	.....	223	20	0	12	191	.....	.....
Cum. 1959	46,187	23,059	1,129	3,404	17,324	1,271	190,136,093	.....	.....	9,072	805	100	301	7,866	.....	.....
Cum. 1958	44,517	21,926	1,017	3,348	17,014	1,212	180,402,102	.....	.....	8,774	844	141	239	7,550	.....	.....
Western Canada	54	27	0	6	18	3	297,518	2,196	2,269	16	2	0	3	11	604	599

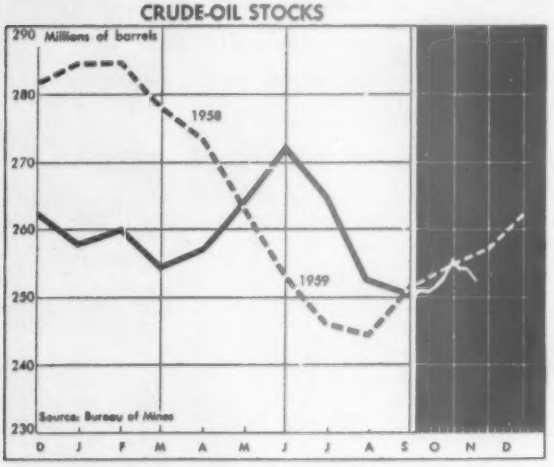
*Incl. week ended Nov. 21 (not previously reported).

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-21-59	11-14-59	11-22-58
Pennsylvania	2,516	2,526	2,825
Other Appalachian	1,969	1,960	1,665
Illinois, Indiana, Michigan	10,224	10,199	9,923
Nebraska and North Dakota	3,190	3,249	2,568
Kansas	9,605	9,425	10,412
Oklahoma	14,896	15,187	17,643
Arkansas	2,207	2,215	2,165
Louisiana	17,724	18,455	17,037
North	3,157	3,220	2,915
South	14,567	15,235	14,122
Mississippi, Alabama, Florida	2,028	2,171	2,630
New Mexico	8,159	8,272	8,590
Texas	111,377	110,537	111,090
East Texas	8,610	8,266	8,166
West Texas	52,400	53,514	54,291
Texas Gulf	19,597	19,036	20,118
Other Texas	30,770	29,721	28,515
Wyoming	17,176	16,969	13,515
Other Rocky Mountain	9,239	8,990	8,724
California	28,983	28,631	32,640
Foreign	†13,180	15,162	14,867
Total	252,473	253,948	256,294

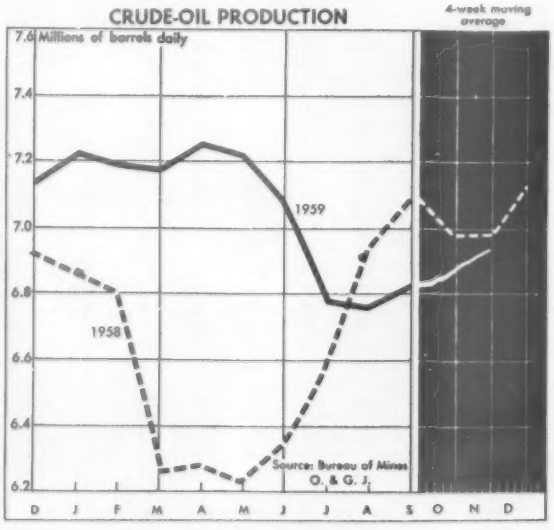
*Bureau of Mines. †Includes 4,536,000 bbl. in California.

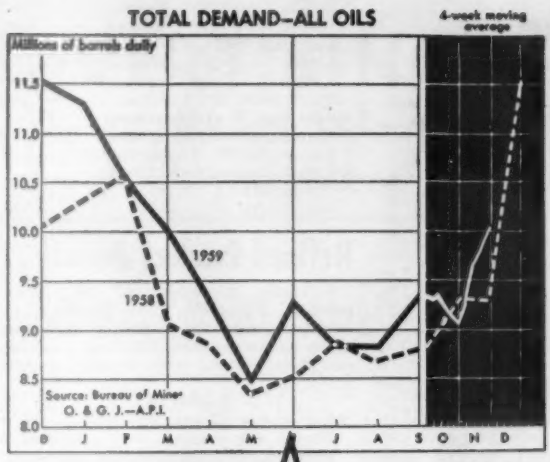
DAILY AVERAGE PRODUCTION FOR WEEK

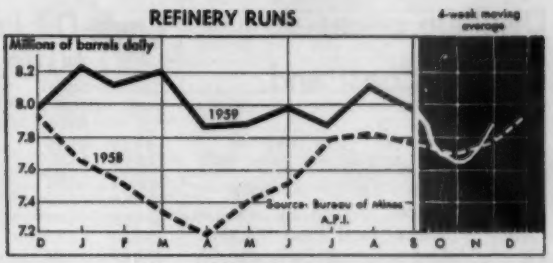
	November 28, 1959			
	Crude oil	Lease condensate	Total	Nov. 21 total
Alabama	16,300	.....	16,300	13,500
Arkansas	70,680	200	70,880	57,800
California	838,100	.....	838,100	838,400
Colorado	126,800	.....	126,800	128,200
Eastern	40,700	.....	40,700	41,800
Florida	1,170	.....	1,170	1,170
Illinois	217,800	.....	217,800	219,600
Indiana	31,700	.....	31,700	31,400
Kansas	†332,500	.....	†332,500	†332,330
Kentucky	77,900	.....	77,900	77,800
Louisiana	923,300	116,250	1,039,550	1,039,530
North	108,300	5,750	114,050	114,030
South	815,000	110,500	925,500	925,500
Michigan	32,200	.....	32,200	32,200
Mississippi	140,050	4,100	144,150	144,150
Montana	82,500	.....	82,500	80,800
Nebraska	64,500	.....	64,500	64,800
Nevada	100	.....	100	100
New Mexico	288,600	5,550	294,150	294,150
North Dakota	51,800	.....	51,800	48,100
Oklahoma	†547,300	.....	†547,300	†550,100
Texas	2,443,000	80,200	2,523,200	2,523,200
Dist. 1	43,000	2,800	45,800	45,800
Dist. 2	104,000	8,400	112,400	112,400
Dist. 3	318,000	38,000	356,000	356,000
Dist. 4	171,000	9,600	180,600	180,600
Dist. 5	25,000	400	25,400	25,400
Dist. 6	102,000	9,500	111,500	111,500
East Texas field	133,000	.....	133,000	133,000
Dist. 7-B	126,000	180	126,180	126,180
Dist. 7-C	118,000	3,320	121,320	121,320
Dist. 8	996,000	5,000	1,001,000	1,001,000
Dist. 9	201,000	2,000	203,000	203,000
Dist. 10	106,000	1,000	107,000	107,000
Utah	104,500	.....	104,500	92,470
Wyoming	341,000	.....	341,000	345,200
Others	‡410	.....	‡410	‡460
Total U. S.	6,772,910	206,300	6,979,210	6,957,260
Change from prev. week, up			21,950	.....
Canada	†517,000	.....	†517,000	†516,400
Total U. S. prod., Jan. 1-Nov. 28				2,334,616,190 bbl.
Same period last year (crude plus cond.)				*2,213,537,710 bbl.

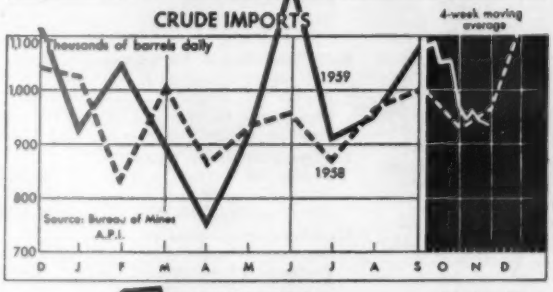
*Includes 52,750,350 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

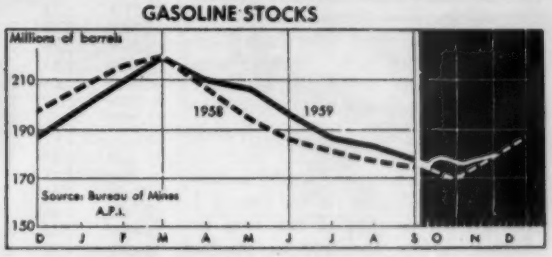
CRUDE-OIL PRODUCTION

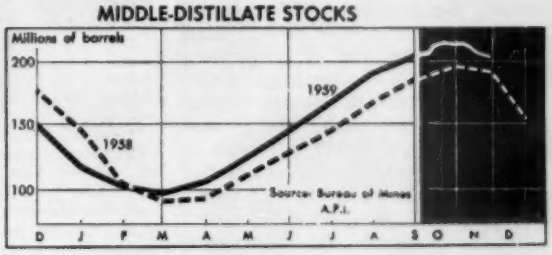


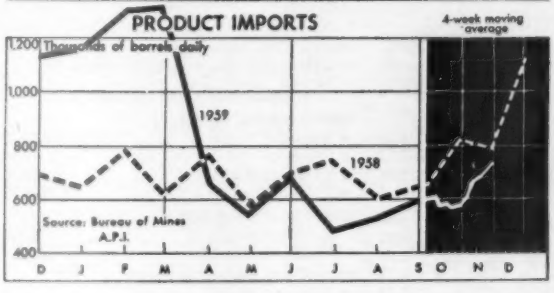

TOTAL DEMAND—ALL OILS
4-week moving average
Millions of barrels daily
1959
1958
Source: Bureau of Mines
O. & O. J.—A.P.I.
D J F M A M J J A S O N D

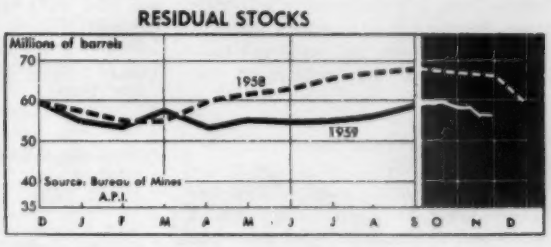












API REFINERY REPORT—NOVEMBER 27, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1958 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,157	528.6	42.0	369.1	153.3	40,553	13,978	68,387	11,213	1,107	491.7	34.4	347.1	168.7
Appalachian:														
District 1 ...	112	44.9	3.1	18.3	16.1	6,037	737	4,493	327	95	41.1	3.9	19.7	10.0
District 2 ...	101	54.9	6.9	20.1	14.6	2,793	590	1,791	498	102	50.7	4.7	18.8	12.4
Ind., Ill., Ky. ..	1,442	766.6	92.4	317.4	213.9	29,497	6,828	27,555	6,223	1,401	745.2	70.1	299.9	174.0
Minn., Wis., Dak.	113	59.0	6.2	28.1	16.3	7,250	1,334	7,191	665	106	50.3	6.3	28.4	11.8
Okla., Kans., Mo.	676	377.0	11.4	183.6	36.6	17,972	1,571	10,767	1,048	702	383.5	14.4	173.8	21.2
Inland Texas ..	290	219.1	9.6	47.6	21.4	6,836	562	1,871	2,330	288	213.8	9.1	49.0	19.9
Texas Gulf Coast	1,812	935.2	119.4	422.9	155.3	21,359	2,899	21,653	6,324	1,804	958.7	126.1	446.7	191.0
La. Gulf Coast .	701	356.1	35.2	185.3	52.4	9,822	1,570	8,050	1,158	680	384.9	21.1	164.4	47.4
N. La. and Ark.	80	68.7	1.7	28.1	7.3	4,823	929	2,392	253	82	43.1	3.2	20.7	6.1
Rocky Mountain:														
New Mexico .	26	15.1	0	4.9	2.4	817	28	237	44	25	12.9	0.4	4.6	2.5
Other R'cky Mt.	286	140.1	4.4	63.4	33.1	4,756	283	2,603	1,179	271	131.8	2.2	63.2	33.4
West Coast ...	1,177	571.4	1.0	154.6	283.0	26,664	383	13,896	24,927	1,113	520.0	3.1	175.8	280.3
Nov. 27, 1959	7,973	4,136.7	333.3	1,843.4	1,005.7	179,179	31,692	170,886	56,189	7,776	4,027.7	350.0	1,812.1	978.7
Nov. 20, 1959	8,017	4,116.6	316.1	1,794.4	962.1	177,260	31,970	174,581	56,292	.....	.....	.....	.....	.....
Nov. 28, 1958	7,785	4,020.1	319.1	1,898.7	933.7	173,600	31,932	161,439	66,199	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Distillate prices up on East Coast and in Group 3

DISTILLATE PRICES are improving. Spot prices moved up on the Group 3 market, and Esso Standard Oil Co. raised prices in its marketing area on the East Coast.

Distillate markets have been firm in the Mid-Continent refining area since the middle of October. Group 3 prices started moving up in the second week of that month and have climbed steadily since that time.

Some No. 2 fuel was selling as low as 8.0 cents a gallon on the Group 3 spot market as late as the first of October. After the middle of the month, the low was 8.25 cents a gallon. Another increase of 0.25 cent came about the first of November, followed by still another boost in the second week of the month. Before the end of November, No. 2 was bringing a good strong 9.0 cents a gallon. The latest increase brings the low of the spot market to 9.25 cents. Some refiners are quoting 9.5 cents.

The increase on the East Coast stems from an entirely different situation. Markets have been so weak in the area that suppliers have not been able to cancel the summer-fill discount of 0.5 cent nor have they been able to recover some of the additional summer price cuts.

The New York barge price for No. 2 in February and March was 11.00 cents a gallon. There was a reduction in April to 10.50 cents and the summer discount resulted in an early summer price of 10.00 cents.

Low prices can be credited to high inventories and warm weather. Gulf-East Coast distillate stocks reached a peak on November 6 when the total was 101,578,000 bbl. Compared with previous years, stocks were up 16,646,000 bbl. or 20%.

Stocks have gone down about 3,500,000 bbl. in recent weeks. Increased demand resulted in the ½-cent price increase to 9.6 cents for barge deliveries in New York. Suppliers have removed the summer-fill discount. Now, they need to get back the other 0.9 cent that was cut off the late winter price.

Tidewater Oil Co. announced a reduction of 30 cents in posted price for Conroe crude in Texas. Also crude from Venice field in Louisiana was cut 7 cents for 40° gravity and 24 cents for 23°-23.9° gravity.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill§ Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

§Union Oil Co. of California posting up to 25 cents less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
★ Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	10.25-10.50
Premium (99 octane)	13.00-13.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-10.75
Regular (92 octane)	10.75-11.00
Premium (98 octane)	12.00-12.25
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.25
Premium (94 octane)	12.65-13.25
Premium (100 octane)	14.15-14.50
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.00-10.25
★ Diesel oil (58 d.i. and above)	9.75-10.00
★ Distillate No. 1	9.75-10.00
★ Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	8.625
Distillate No. 2	8.125
New York Harbor (barges):	
★ Kerosine 41-43	10.10
★ Distillate No. 2	9.60
★ Diesel fuel, 48-52 d.i.	9.90
Caribbean area (cargoes):	
Distillate No. 2	8.125

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max 1% S)	1.70-1.90
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-USNH, dirty (ATRS—22.5%)	$2.21
★ Carib.-USNH, dirty (ATRS—42.5%)	1.58
★ Carib.-UK, dirty (USMC—60%)	2.62
★ PG-UK, dirty (Scale—43.75%) (33s. 2d.)	4.64

★ Denotes change from previous week.

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18" AND 20", good used pipe. Very attractive prices. Contact: The Tri-State Pipe Co., Bellaire, Ohio. Telephone OR 6-1452.

A REAL BUY—Two 36-L Bucyrus-Erie Drilling Machines, skid mounted, GK Waukesha engines, located, Luling, Texas. Priced exceptionally low. Degen Pipe & Supply Co., Tulsa, Oklahoma.

FOR SALE: 2000' Mayhew Rotary with 35' Kelley and King Swivel mounted on 1949 tandem Ford truck. The rest of the equipment to drill 1900' is available. Also 1 light plant. Eugene Smith, Box 363, Caney, Kansas, Phone 758 day and Phone 871 night.

FOR SALE: Failing 1500 heavy duty drilling rig truck mounted, 5 x 8 Gardner Denver pump and motor, welder, light plant on trailers, 1200 water tank on R185, 2-ton flatbed winch and headframe, Pickup, House Trailer, 1,680 feet 2⅜ drill pipe, diamond core barrels, 8 drill collars, subs, adaptors, handtools. Graystone Drilling Co., 404 Texaco Bldg., Dallas, Texas. RI 7-5707.

10,000'—4½" API Full Hole Drill Pipe, T. J. 5½" to 5⅞" OD, Excellent condition, Reasonable Priced. Don Harman Pipe & Supply, Oklahoma City, OR 7-4343.

1 BUCYRUS—ERIE 36L Spudder, late model. Rig complete with tools and equipment. Cassel Drilling Co., Inc., Dumas, Texas. Phone WE-5-5019 or WE 5-4369.

RE-WORKED WELL SERVICE WORK-OVER UNITS

Ready for use. Truck mounted Wilson Senior single drum servicing unit with single pole mast, $4,000. Trailer mounted N-3 Brewster single drum drawworks with 85/8"x103/4"x87' double pole mast, $15,000. Truck mounted H. S. Cardwell single pole mast well servicing unit, $4,500. All prices F.O.B. Tulsa, Okla. Wilson Mogul double drum spudder, double pole mast, 145 G.K.U. Waukesha power, complete with lines and tools, F.O.B. Seminole, Okla., $11,750. Write or call: Franks Division, Cabot Shops, Inc.; 3218 Whittier Station, Tulsa, Okla. Phone WEbster 9-6381.

"1" ONE OR "2" TWO 48L BUCYUS rigs with or without tools. Phone BR 3-5551; write, 306 Austin, Borger, Texas.

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New
5,000'—9⅝"ODx32# Range 2, 8Rd, T&C, Seamless Steel Casing
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50,000'—10¾"ODx40.5# No. 1 Grade, 8-V, T&C, Range 1, Excellent for Casing or Line Pipe
20,000'—6⅝"ODx18.97# No. 2 Grade, Range 2 and 3, P.E., Good for Oil Line
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20,000' 6⅝" O.D. x .250" wall, plain end used line pipe. 30,000' 10¾" O.D. x .307" wall, plain end used line pipe. Other sizes in stock. The Buckeye Supply Company, 18 Harrison Street, Zanesville, Ohio, Phone GLadstone 2-3641.

DRILL pipe, 2⅞", 2⅜" 20 ft. Franks KC 45 complete. Failing 1500. Box L-605, The Oil and Gas Journal, Tulsa, Oklahoma.

A REAL BARGAIN—3 complete RL Cardwells, with 150/HP engines, 2 with telescopic masts; one only 7 years old. Located Tulsa, Pampa, Texas, Chase, Kansas. Unusually low price. Degen Pipe & Supply Co., Tulsa, Oklahoma.

MODEL M. COOPER double drum service unit with 10¾" by 8⅝" 63' mast with rod hanger and tubing board, mounted on L 192 International Tandem. 1954 Chev. ¾ Ton with hydraulic tong power source and 1 set of Hillman-Kelly Hydraulic Tongs, all propane equipped. $10,000.00—Terms. Phone 110, Madison, Kansas.

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500,000 ft. 10¾" O.D. 35#
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Used Pipe—Excellent Condition
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55 miles # 1 Double
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INGERSOLL RAND BLOWERS
2—1,700 HP Turbine Drive
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10'x145'-125 PSI 50 trays
9'6"x121'6"-325 PSI 30 trays
8'6"x103'6"-165 PSI 24 trays
7'x82'-75 PSI 30 trays
6'x80'-300 PSI 30 trays
4'x44'6"-150 PSI 12 trays
3'6"x36'4"-400 PSI 12 trays
30"x52'4"-360 PSI 22 trays
26"x57'-78 PSI 4 trays

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Steel tube ..... 7,500 to 100 sq. ft.
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Cu Ni tube ..... 2,330 to 308 sq. ft.

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1—Two Stage CENTRIFUGAL
7,860 CFM 2,000 HP
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60"	33'	15	245
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48"	34'	4	275
42"	61'	24	100
42"	22'	8	130
42"	30'	8	25
36"	58'	30	154
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PRODUCTION FOR SALE — 6 producing wells on Sec. 8-22N-15E, Roger County. Wells and Equipment 3 years old on 160 acres, Sims & Archer lease. Wells spaced for water flood. Lease has 3 offsets now to be drilled. Will take $18,000 for deal. 600 Oil Company, Miles City, Montana.

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Discovery wells

(Continued from page 215)

11,974-85 ft. TD 13,372 ft. New pay in Delta Farms field.

Terrebonne Parish: Mississippi River Fuel Co.-Hope Natural Gas Co. 3 State Lease 3043. Township (no section) 23s-16e, in Pass Wilson, Block 41, Ship Shoal Area. IP 38 BOPD, 4,250 M.c.f.d., 16/64-in., 51.7°, TP 2,700 psi., perf. 9,273-90 ft. TD 16,681 ft. Second well and new pay in Pass Wilson field.

MONTANA

McCone County: Gulf States Oil Co. 1 Welcome Curtiss, NW SE 26-22n-48e. IP Swabbed and flowed 300 bbl. per day, Devonian 9,163-80 ft.; Silurian 9,260-9,307 ft. Devonian discovery, new field in Duck Creek area. TD 9,686 ft.

EAST TEXAS

Limestone County: Ralph Spence 1 Favors estate, Juan Luis Chavert Sur., 4 miles east of Thornton. IP 4,700 M.c.f. of gas, plus unestimated amount of condensate, Travis Peak 7,084-97 ft. TD 7,282 ft., elevation 525 ft.

TEXAS PANHANDLE

Hansford County: Pan American Petroleum Corp. 1 Kansas City Mineral Royalty Co., Sec. 45, Blk. R, AB&M Sur., 12 miles southeast of Spearman. IPCAOF: 2,600 M.c.f.d., Cleveland 6,526-30 ft.: IPCAOF: 10 M.M.c.f.d., Morrow 8,420-36 ft. TD 8,600 ft. Dual zone gas discovery.

Moore County: Natural Gas Pipeline Co. of American 101 J. T. Sneed, Sec. 54, Blk. B-13, G&M Sur., 16 miles east of Fourway. IPCAOF: 840 M.c.f.d., Red Cave 1,575-1,612 ft. TD 1,870 ft. Permian gas discovery.

103 J. T. Sneed Est., Sec. M-15, N. Jones Sur., 18 miles southeast of Dumas, inside Panhandle field, 25 miles southwest of Cator Tubb sand field. IPCAOF: 6,000 M.c.f.d., Red Cave 1,540-71 ft. TD 1,923 ft. Permian gas discovery.

Ochiltree County: Stekoll Petroleum Corp. 2-108 S. P. Daniel, Sec. 108, Blk. 4-T, T&NO Sur. IPF: 104 BOPD, ½-in. choke, 41.7°, Cleveland 6,641-57 ft. TD 7,155 ft. IPF: 29 BOPD, 48/64-in. choke, 39.1°, Cherokee 7,079-7,106 ft. Cherokee discovery.

WEST TEXAS

Gaines County: Texaco Inc. 1 M. S. Jones, NCT-1, Sec. 12, Blk. A-7, PSL Sur., 24 miles northwest of Seminole. IP 361 BOPD, 22/64-in. choke, 42°, TP 150 psi., Devonian 11,100 ft. TD 11,115 ft., elevation 3,639 ft.

Howard County: Basin Oil Co. 1 E. G. Cates, Sec. 13, Blk. 34, T3N, T&P Sur., 2 miles southeast of Ackerly. IPP 181 BOPD, 38°, GOR 250:1, Spraberry 7,675-7,705 ft. TD 9,150 ft., ground elevation 2,795 ft.

Sabre Drilling Co. 1 Quinn, Sec. 26, Blk. 34, T1S, T&P Sur., 8 miles southwest of Big Spring. IPP 68 BOPD, 31°, GOR 80:1, San Andres, 3,304 ft. TD 3,390 ft., elevation 2,518 ft.

Irion County: Paul Schkade Drilling Co. 1 Pfluger, Edward G. Livingston Sur. 680-½, 10 miles northeast of Mertzon. IPP 35 BOPD, 38°, Permian 817-822 ft. TD 822 ft.

Sterling County: W. H. Black 1 T. H. Humble, Sec. 21, Blk. 11, SPRR Sur., 2 miles south of Broome. IPP 16 BOPD, 31°, Permian 1,345-49 ft. TD 1,349 ft.

Yoakum County: H. L. Lowe 1 Forkel, Sec. 376, Blk. D, John H. Gibson Sur., 5 miles northeast of Plains. IPP 69 BOPD, 33°, San Andres 5,369-85 ft. TD 5,400 ft.

WYOMING

Crook County: Champlin Oil & Refining Co. 1 State, C SE NW 36-51n-68w. IPP 500 BOPD, 19.6°, Minnelusa discovery, new field. TD 6,745 ft.

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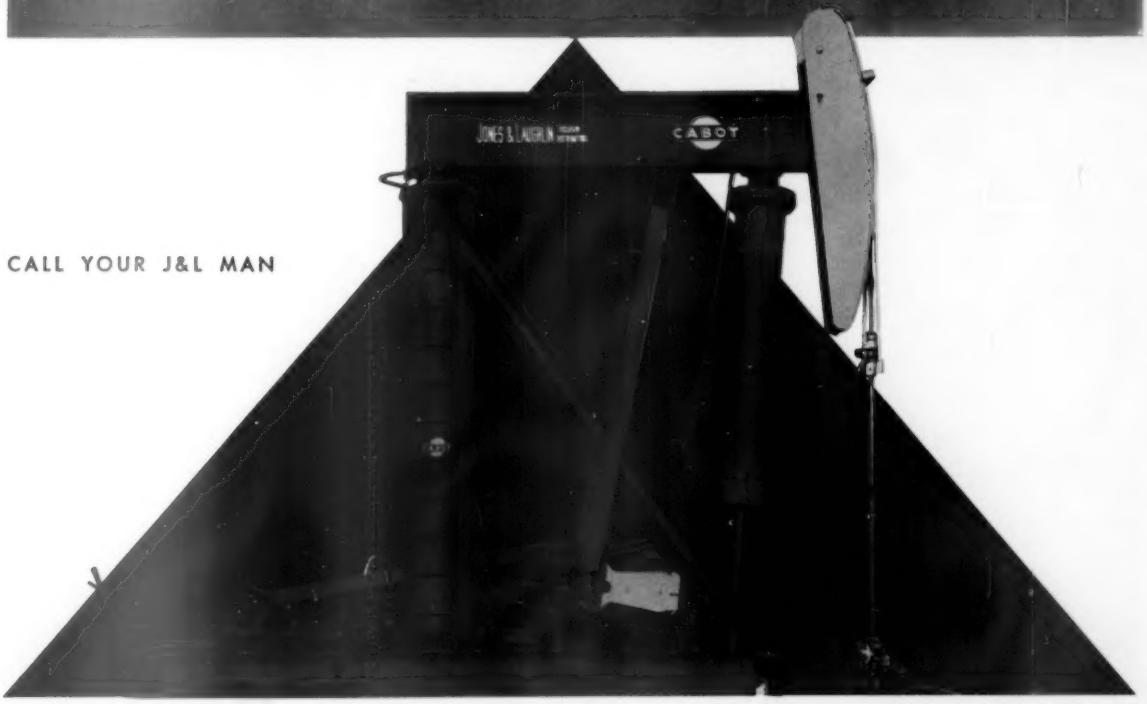
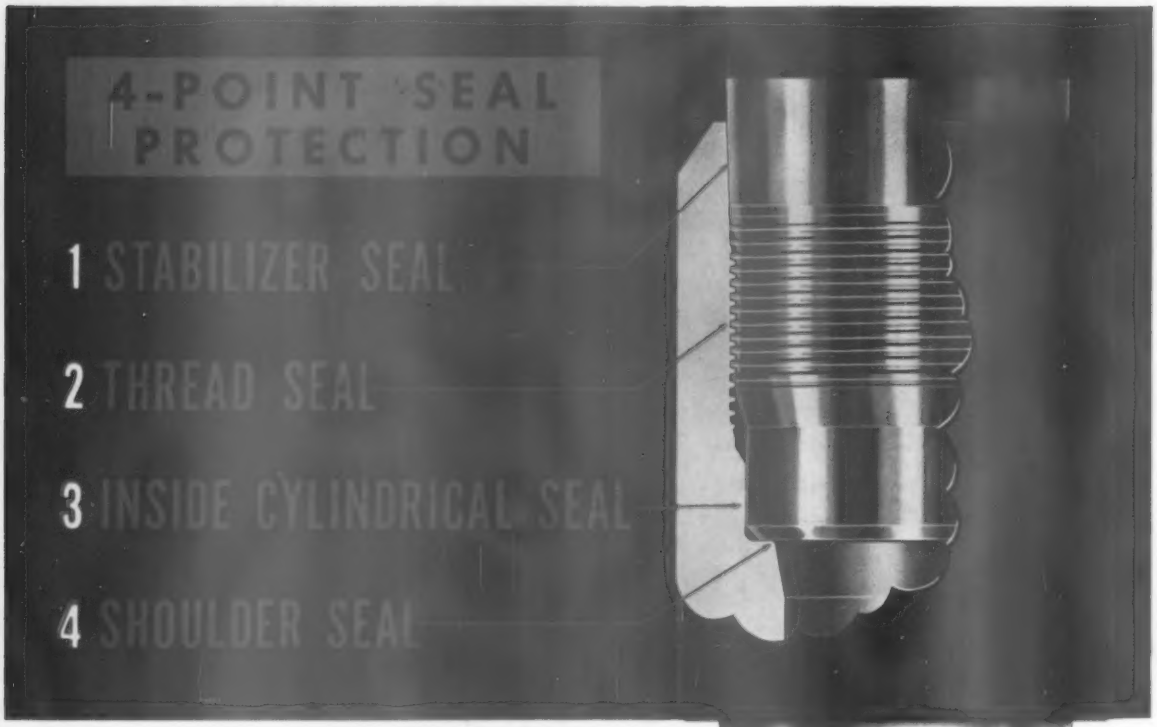
- Large air balance tank and reserve capacity
- Unitized air tank and Samson post
- ASME Code air tank
- Positive piston sealing
- Automatic air controls
- Long life roller bearings

CALL YOUR J & L MAN FOR THE DETAILS. IT'S A QUICK WAY TO MAKE A LITTLE EXTRA MONEY — BY SAVING WITH CABOT!

CALL YOUR J&L MAN



No joint leakage...no creep with AMERICAN IRON Straight Grip Tool Joints!



No worry about joint leakage or creep with our 4 POINT SEAL PROTECTION . . . in fact, the seal actually becomes TIGHTER as the tension load and pump pressure are increased.

AMERICAN IRON Straight Grip tool joints are *three times* as strong as the pipe they connect! You'll like the quick, easy way this hand applied Straight Grip can be removed and installed right at the rig. STRAIGHT GRIP tool joints are ideal for handling high tensile drill pipe.

These are just a few of the reasons why you buy quality when you specify AMERICAN IRON.

AVAILABLE THROUGH YOUR SUPPLY STORE

AMERICAN IRON
Straight Grip
TOOL JOINT

AMERICAN IRON

Amf Product PETROLEUM EQUIPMENT

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518 North Indiana Avenue Oklahoma City Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

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